Alice Everett in 1886 (seated centre)

Alice Everett and Annie Russell Maunder torch bearing women astronomers

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1 Introduction

If one excepts Caroline Herschel, who in 1787 was granted £50 a year by the King to be assistant to her illustrious brother, the first salaried women astronomers in Britain were the "lady computers" at the Royal Observatory Greenwich in the 1890s[1]. Of the dozen or so women recruited under that short-lived scheme, there were only two who persevered in their scientific aspirations. They were Alice Everett (1865-1949) and Annie Dill Russell (later Mrs Maunder) (1868-1947). It is noteworthy that these pioneers were both Irishwomen, educated in Belfast schools and at Girton College, Cambridge before joining the Greenwich staff. Their lives diverged in 1895 when they left Greenwich, one to seek fresh fields in astronomy and physics, the other to marry and continue her astronomical interests with the support of her astronomer husband.

2 Alice Everett

Alice Everett was the daughter of Joseph David Everett FRS (1831-1904), Professor of Natural Philosophy at Queen's University Belfast[2]. She was born in Glasgow but was only two years old when her father took up his chair in Belfast where he remained until his retirement thirty years later. Her mother was Scottish, the daughter of a Church of Scotland minister; of the family of three sons and three daughters only Alice appears to have followed in her father's scientific footsteps.

Alice was educated at the Methodist College in Belfast, a coeducational day school with a strong ethos of "plain living and high thinking" which after initial struggles had achieved a high level of academic distinction[3]. She was a prize pupil whose later attainments are recorded with pride in the annals of the College. Higher education for women in Ireland at that time was catered for by the Royal University of Ireland, a purely examining body which awarded degrees to any student who passed its examinations, conducted under the aegis of the Queen's Colleges. In 1882 Queen's College, Belfast, opened its doors to women students, enabling them to take lectures in preparation for the Royal University examinations[4]. Alice Everett chose this option, and in 1884 took first place in the first-year scholarship examination in science, an event which caused the university authorities to consider the question of the eligibility of women for scholarships[5]. The result was negative: it was not until 1895 that the statutes were changed to place women on an equality with men. Alice Everett proceeded from Belfast to Cambridge, and while at Cambridge sat and passed with honours the Royal University of Ireland's Batchelor of Arts degree in mathematics and mathematical physics in 1887. She was awarded its advanced Master of Arts degree two years later.

3 Annie Russell

Annie Scott Dill Russell was born in Strabane, Co Tyrone, the elder daughter of Reverend William Andrew Russell (1824-1899), minister of the Irish Presbyterian Church, and his second wife (nee Dill) who was herself the daughter of a minister in the same Church. There were six children in the Russell household - two sons from the first marriage, and two sons and two daughters from the second. The family had a devoutly Christian and serious-minded upbringing; all six children were high-level academic achievers.

Annie Russell received her secondary education at the Ladies' Collegiate School, Belfast (renamed Victoria College in 1887), a pioneering institution founded in 1859 to provide a proper academic education for girls which became the most successful girls' school in the country[6]. A senior class prepared pupils for the external Royal University examinations, but Annie Russell did not proceed to an Irish university degree. Instead, having won a prize in the public Irish Intermediate examination in 1886, she sat the Girton open entrance scholarship examination without any special preparation,

and was awarded a scholarship of £35 annually for three years[7].

4 Girton College, Cambridge

Alice Everett and Annie Russell, 21 and 18 years of age respectively, entered Girton College Cambridge in an intake of 29 students in 1886. Girton College, the first women's college in Britain of university rank, had been established in its Cambridge site in 1873. From 1882 women were permitted to sit the Cambridge Tripos (i.e. degree) examinations, though the university did not grant them degrees, a right not conceded until 1928.

Both women attained honours in the mathematical tripos in 1889. Annie Russell was the top mathematician of her year at Girton, being ranked Senior Optime in the university class list. Hers was also the highest place ever taken at Cambridge by a woman candidate from Ireland[8]. "More than ordinarily handicapped - even for a woman - by an insufficiency of preliminary training, nothing but the the power Miss Russell has of throwing herself completely into her work, could have enabled her to read as far as she has, and with such success", wrote her mathematics tutor, W.H. Young, Fellow of Peterhouse. The Mistress of Girton College, Elizabeth Welch, also testified to the "diligence, intelligence and conscientiousness which characterised her career as a student"[9].

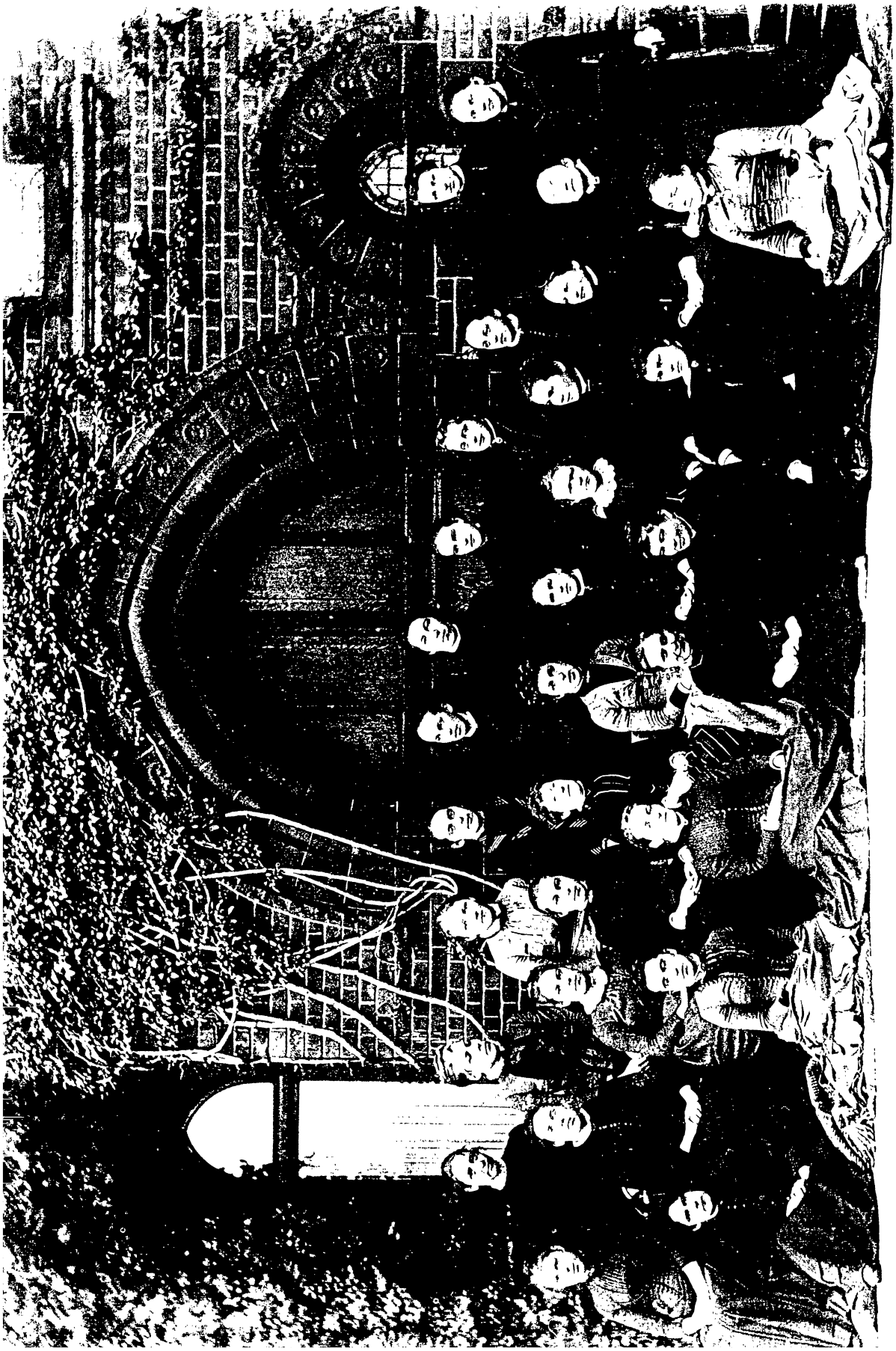
5 Lady Computers at Greenwich

Sir William Christie, Astronomer Royal between 1881-1910, was responsible for first introducing women to the staff of the Royal Observatory at Greenwich. The Observatory's scientific staff of Chief Assistant and 8 other assistants had the help of 8 established computers in the various departments. To these were added "supernumerary" or extra computers whose lowly posts were of a temporary nature. It was at this rank that the "lady computers" were recruited.

Alice Everett joined the Greenwich staff in January 1890[10], and Annie Russell, after a year as mathematics mistress at the Ladies' High School on the island of Jersey (a profession she did not think herself suited to[11]) was keen to join her friend there. Informed by Alice of a possible vacancy she wrote to the Astronomer Royal more than once offering her services. Her application was supported by a testimonial from Sir Robert Ball, then at Dunsink Observatory, Dublin, a friend of her family, who wrote directly to Christie. The Chief Assistant, H.H.Turner, on the Astronomer Royal's authority, offered her a post at £4 a month. She protested that the salary was so small that she "could scarcely live on it". "Does the fact that I have taken the mathematical tripos at Cambridge make no difference?", she asked. The reply was to the effect that she might take it or leave it. She had no alternative: she accepted the post and, with a stipend less than Caroline Herschel's a century earlier, began work on September 1, 1891[12].

Alice Everett was assigned to the project of the Astrographic Catalogue (the Carte du Ciel), the international undertaking initiated in 1887 which aimed at surveying the entire sky photographically and at cataloguing all stars brighter than 11 magnitude. The participating observatories were equipped with identical astrographic refractors and apportioned their particular areas of sky. The Royal Observatory at Greenwich installed its astrographic refractor in 1890[13]. The work involved taking the actual photographs, and subsequently measuring the coordinates of the stars from the photographic plates and reducing them for the final catalogue. Alice also worked in the transit department of the observatory under Turner where her duties were not confined to computing - she made observations with the transit circle as well as reducing them[14], evidence that at least one woman was engaged in night observing at Greenwich in the 1890s.

Annie Russell's work was of a more exciting kind. She was allotted to the solar department, helping (Edward) Walter Maunder with the famous Greenwich photoheliographic programme. The solar department at Greenwich had been set up by Sir George Airy in 1873 for regular photography of the sun, and Maunder was appointed to the new post of photographic assistant to carry out the work, a post he held for his entire working life. Though not university educated, Maunder was an excellent observer who attained a lasting reputation as a solar astronomer. The routine which Annie followed as Maunder's amanuensis would have entailed photographing the sun, weather permitting, developing the photographs and examining the 8-inch negatives with a measuring micrometer. The position of each sunspot relative to the centre of the image, and its apparent area, were measured; subsequent calculations converted these observations to heliocentric coordinates and true areas as fractions of the sun's surface[15]. Annie was fortunate in being recruited at the approach of the sunspot maximum of 1894; she witnessed the famous giant spot of July 1892



The 1886 matriculation class at Girton College Cambridge, Alice Everett is seated fifth from left in the middle row. Annie Russell is standing at the extreme right holding chair

and the accompanying magnetic storm recorded by the Greenwich magnetic department.

The two enthusiastic young women evidently gave satisfaction, as in 1892 they were proposed by Maunder and A.M.W. Downing (Superintendent of the Nautical Almanac Office) for fellowship of the Royal Astronomical Society. Unfortunately when their nominations came to the vote, they failed to gain the requisite two-thirds support of the all-male Fellows. However, the British Astronomical Association (BAA), expressly founded in 1890 to cater for amateurs including women, made them welcome. Alice Everett contributed accounts to the BAA Journal of her observations of the total lunar eclipse of November 15, 1891 and of Nova Aurigae of 1892[16], and in 1893 was appointed the Association's secretary. She also wrote up for the Observatory magazine the reports from the various expeditions observing the total solar eclipse of April 16, 1893 in South America and Africa. Annie Russell was to be closely involved with the BAA for the rest of her life. In November 1894, during the Presidency of Maunder, she was made editor of the Association's Journal, a duty which she discharged with notable success for 35 years. It cannot be an exaggeration to say that without an efficient and knowledgeable editor for their journal the Association would not have played the important role it did in the early decades of its existence. Members of the British Astronomical Association, many of them observers of the physical features of the moon and planets, filled a gap left by the new astrophysical institutions which tended to concentrate on stellar physics.

After five years at Greenwich Alice Everett moved to the Astrophysical Observatory in Potsdam in Germany and began work there on October 1, 1895. On December 28 of the same year Annie Russell married her boss Walter Maunder having, on October 31, in accordance with the rules of the civil service regarding married women, resigned from her post.

6 Alice Everett's later career

6.1 Astronomy abroad

The Astrophysical Observatory at Potsdam was Europe's leading institution for astrophysical research set up in 1882 under the directorship of the pioneering stellar spectroscopist H.C.Vogel who was still in charge. Alice Everett's post was that of scientific assistant working on the Carte du Ciel, the same kind of work that she had been doing at Greenwich, and was a three year temporary replacement for A.Schwassmann while he was away on military service[17]. The rest of the staff of ten astronomers were men. Under the supervision of J. Scheiner, Alice Everett appears to have been involved in all aspects of the work. In the year 1897, for example, she measured and reduced the positions of 22,000 stars on 72 plates[18]. During this period she also published two papers in Monthly Notices of the Royal Astronomical Society on the orientations of the orbits of binary stars and made a few short contributions to the Journal of the BAA, including a desription of the Potsdam Observatory[19].

On finishing at Potsdam, Alice Everett was employed as assistant for one year, 1898-99, at the observatory of Vassar College, USA, the women's college where Mary Whitney, successor to Maria Mitchell, was professor of Astronomy. This small institution had only one member of staff besides Miss Whitney, and Alice Everett no doubt was pleased to have the opportunity of working there, even temporarily. Her year was fruitful and resulted in two papers jointly written with Mary Whitney on observations of minor planets and a comet in the Astrophysical Journal[20].

In July 1899 Alice Everett applied to James Keeler, Director of the Lick Observatory for a position on his staff. Keeler was most anxious to have her, and wrote to Mrs Phebe Hearst, a benefactress of the observatory, asking if she would consider establishing a position for women at the Lick Observatory which he could offer to Miss Everett, "a lady of distinction in astronomical science" he wrote, "admirably qualified to aid us in a most important part of our work - the measurement of our photographs of star spectra in which we were falling sadly behind". He suggested that the post should be at the grade of assistant astronomer with a salary of $1200 per year, as "in the case of as capable a lady as Miss Everett I should not like to offer less". Mrs Hearst was sadly unable to help, though she expressed regret at not being able "to secure the valuable service of so brilliant a scholar"[21]. It is not known if Alice tried other American observatories at this stage; if so, she had no greater luck, as in 1900, at the age of 35, she was back in England again, without a job. It was in fact the end of her career as an astronomer.

6.2 Physics in London

Alice did not, however, remain idle. She and her father, recently retired from his chair in Belfast, set about translating into English a monograph on Jena optical glass and its scientific applications, first pub-

lished in German in 1900. The work, a highly technical one which included references to the testing of the Potsdam refractor by Vogel and other matters familiar to Alice from her German experience, appeared in 1902[22]. Alice also made herself useful preparing the mathematics and physics "slips" for the Royal Society Catalogue of Scientific Papers[23]

From this time onwards Alice's principal scientific interest was optics. In December 1902 a short paper by her was communicated to the Physical Society of London by her father, an active Fellow of that Society. The paper, described experiments on zonal aberrations in lenses[24] carried out in the Davy-Faraday Laboratory of the Royal Institution. Brief though the paper was, it had the distinction of being the first by a woman to appear in the Proceedings of the Physical Society.

J.D.Everett died in 1904. The next decade or more of Alice Everett's life is obscure. There was little opportunity for paid employment in astronomy in Britain: she could not, even if she had wished to, return to her old position at Greenwich, as by this time the Astronomer Royal had become disillusioned with his "lady computers" and had put an end to the scheme.

It may have been at this stage that Miss Everett took an advanced course in practical Optics at South Kensington, mentioned in her Curriculum Vitae[25]. A paper on the spectre of the Brocken in 1913[26] is the only glimpse we have of her from then until she emerges again in her second career as a physicist.

6.3 The National Physical Laboratory

The new opportunity came in World War 1 (1914-18) when it became necessary to recruit women into formerly male occupations to replace men who were absent on active service. After a year spent in the optical laboratory of the firm of Hilgers in London[27], Alice, at the age of 52, joined the National Physical Laboratory as a junior assistant in the Physics Division on October 9, 1917.

The staff numbers at the National Physical Laboratory rose in that year from 200 to over 500. While the majority were engaged in testing of instruments and materials - of optical instruments alone almost 30,000 telescopes, sextants etc. were tested in the year 1917-18 - there were also research scientists, officially termed assistants, who were university graduates, with a Chief Assistant in charge of each division. Alice Everett had to start on the bottom rung of the scientific ladder on a salary scale of £175 to £235 per annum[28]. She was duly promoted after two years to the next higher rank, which she retained until her retirement.

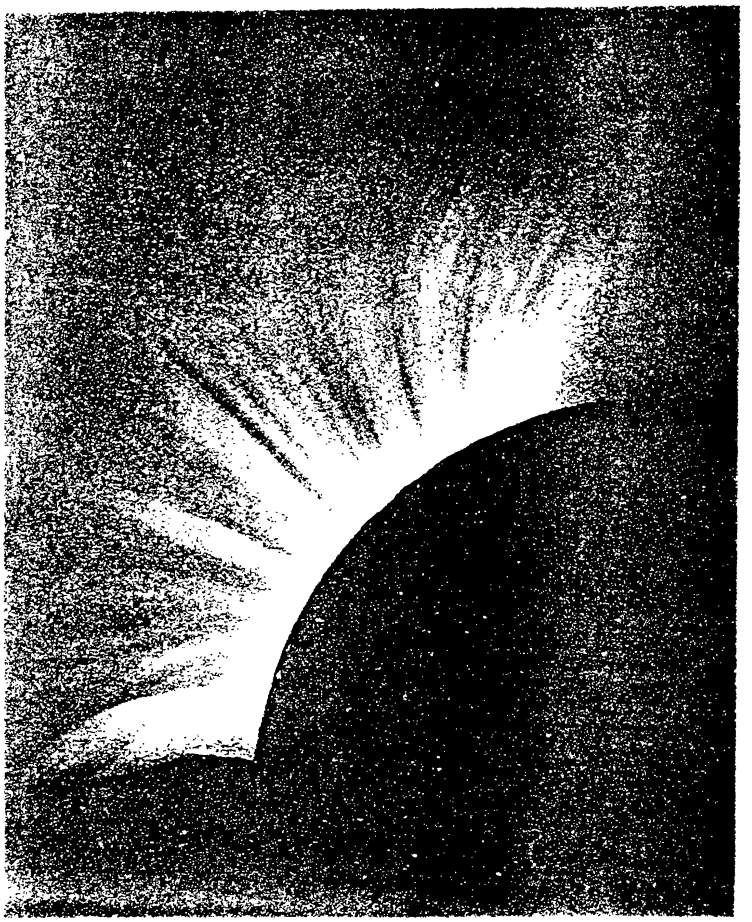
Alice Everett was one of a team of 13 scientists in the Optical section of the Laboratory, of whom four out of five junior assistants were women. Their research was concerned with the design of optical instruments, photometry and spectrophotometry. Alice Everett worked mainly on theoretical problems, her special field being the calculation of aberrations in lens and mirror systems. Her success in these original researches may be judged from her resulting publications in the scientific literature listed in the Annual Reports of the National Physical Laboratory[29]. She left the National Physical Laboratory on May 15, 1925 on reaching the statutory retiring age of 60.

6.4 Into Engineering

Though now retired, her career was not over for this irrepressible woman. During the next two winters (1926-28) she attended evening classes on practical wireless at Regent Street Polytechnic, London, and in Spring 1928 took and passed the College's examinations in "wireless, HF and AC measurements"[30]. In the session 1928-29 she did research in the electrical engineering department of the City and Guilds College (a constituent of Imperial College)[31].

There now followed a most fascinating period in Alice Everett's life, namely her association with the Baird Television Company and the Television Society. On January 26, 1926 the engineer and pioneer inventor John Logie Baird (1888-1946)[32], gave the first demonstration in Britain, and reputedly the first in the world, of a television image. The demonstration took place in a garret in Soho, London, to an invited audience of 40 guests, among them Sir William Bragg and members of the Royal Institution. At least two women scientists - unnamed - were present; Alice Everett may have been one of them. In September 1927, the Television Society (now the Royal Television Society) for the promotion of television research came into being. Alice Everett was one of its 325 foundation members, known as Fellows[33], of whom only 4 or 5 were women. She remained a Fellow for the rest of her life.

The Baird Television Company was associated with the British Broadcasting Corporation (BBC) from 1929 until 1935[34]. Among the receiving and transmitting apparatus developed by the Company during that period was a "mirror drum" used as an alternative to the perforated disc for producing



Drawing by W. H. Wesley of coronal streamers photographed by Mrs Maunder (January 22, 1898)

Solar corona showing polar plumes photographed by Mrs Maunder (Mauritius, May 18, 1901)

the necessary scanning light beam. Baird's version of the mirror drum, first demonstrated on June 30, 1932, had a rotating aluminium cylinder or drum with 30 small mirrors positioned around its edge, each inclined at a slightly different angle from its neighbour[35]. Alice Everett suggested an improvement to this device which would allow a larger number of mirrors to be employed without a corresponding increase in the size of the apparatus. She also looked into the question of increased efficiency by the use of more highly reflecting metals for the mirrors. These ideas were evidently put to the Baird Television Company and received with favour, as on January 30, 1933 a patent for the invention was applied for jointly by herself and the Company[36]. The new drum was never constructed, however. Television broadcasting on the Baird system came to an end in 1935 when the BBC changed over to a rival company. Alice Everett's patent was abandoned, undoubtedly because the device no longer had a commercial future.

Alice Everett continued to give service to the Television Society by translating foreign language publications for its library's index of current literature[37]. In 1938 she was awarded a civil list pension of £100 a year in recognition of her and her father's contributions to physical science (she had no pension from the National Physical Laboratory, having served for less than the required 10 years). She died in London on July 29, 1949, aged 84, leaving her library of scientific books to the Television Society.

7 Annie Maunder's later career

7.1 Eclipses of the Sun

Walter Maunder was a widower approaching 45 years of age when he married Annie Russell, aged 27. His first wife had died in 1888 leaving him with a family of five children whose ages at the time of his marriage to Annie ranged from 21 down to only 7. Walter and Annie had no children of their own. No doubt the rearing of the youngest stepchildren took up a great deal of Annie's time and energy; yet she was by no means cut off from astronomy. On the contrary: she carried on her editing of the BAA Journal and soon found herself preparing to accompany her husband on an expedition to Norway to observe the total solar eclipse of August 9, 1896.

Maunder was an experienced eclipse observer, having taken part in the official British expedition of August 1886 in the West Indies. The expedition planned for 1896 was organised by the British Astronomical Association, the first such venture by that society. The eclipse was unfortunately clouded out at their station at Nova Zembla; however, the expedition was long remembered as an outstanding social success[38].

Another opportunity to observe a total solar eclipse arose on January 22, 1898, this time in India. The Maunders made their own private arrangements, "hampered by no restrictions whatsoever, having received absolutely no financial help from any public body"[39]. Annie while still unmarried had offered some hints for the Indian eclipse in the pages of the BAA Journal[40], recommending suitable tents and equipment, doubtless advised by her sister who was a doctor in Poona. The Maunders were favoured with excellent weather and achieved satisfactory results in the form of photographs of the solar corona. They each had their separate apparatus; Mrs Maunder devised her own short-focus camera with a lens of only 1.5 inches diameter which covered a wide field of sky and was able to reach the outermost regions of the corona. This piece of equipment had been originally intended for a different purpose: Mrs Maunder had been awarded a grant of £40 from her old College, Girton, from the Pfeiffer Fund for research "to undertake a systematic survey of the Milky Way"[41] for which she would have required just such a wide angle instrument. The eclipse work was a happy substitute for the Milky Way project. One of her photographs showed a coronal streamer extending to 10 million kms or 14 solar radii, the longest extension yet observed[42]. When the results of the various British expeditions were displayed at a Royal Society soirée the astronomical writer Agnes Clerke gave her verdict: "As regards the corona, Mrs Maunder with her tiny lens has beaten all the big instruments"[43]. Agnes Clerke reproduced Mrs Maunder's photograph in her book Problems in Astrophysics[44], but later writers appear to have overlooked this remarkable observation.

The Maunders took part in two further eclipse expeditions, both favoured with clear skies, to Algiers in May 1900 and to Mauritius in May 1901. They were accompanied on the former trip by Maunder's two daughters, Edith and Irene, then in their early twenties. Again the Maunders concentrated on coronal photographs. Though the 1900 eclipse revealed nothing unexpected, the 1901 coronal photographs produced a valuable result. When compared with others taken an hour and a half ear-

lier by teams at Sumatra the details of the corona were found to be different, demonstrating that the corona, like prominences, rotates with the Sun and undergoes change. To make such a comparison required photographs of high quality. Such were provided by Annie Maunder, who on this occasion concentrated on the inner corona which, in a year of sunspot minimum, had a characteristic round shape. Each of her photographs covered one quadrant of the Sun and showed a most delicate pattern of plumes and prominences[45].

7.2 Solar Physics

The principal contributions to solar physics associated with the name of Maunder are the analysis of the cyclical variation in sunspot latitudes (the "butterfly" diagram) based on almost 30 years' of continuous observations of sunspot positions on the solar disk, and the discovery of a 27-day periodicity in terrestrial magnetic activity associated with the synodic period of the sun's rotation, both published in 1904. Other notable findings were the correlation between terrestrial magnetic storms and giant sunspots near the centre of the sun's disk, and the explanation of the low-sunspot period in the 17th century (the "Maunder minimum"). It is not necessary to elaborate on these researches which are amply described in the literature and in accounts of Maunder's life[46]. Some of the papers in the series were published in the joint names of E.W. and Annie Maunder[47]. The basic work consisted in the analysis of accumulated solar and magnetic data, which of course Annie was able to perform at home: being academically more qualified than her husband, it would be surprising if the wife had not played a significant part. Mrs Mary Evershed, a close friend and fellow-member in the British Astronomical Association, tells us that Mrs Maunder "shared in all her husband's work and writing in astronomy"[48], echoing Maunder's dedication in one of his books to his wife, his "helper in all things".

7.3 Popular Writing

In 1910 the Maunders published a popular book, The Heavens and their Story, Annie's name appearing as the first author on the title page[49]. In a Preface, Maunder states that the book "which stands in the joint names of my wife and myself, is almost wholly the work of my wife, as circumstances prevented me taking any further part in it soon after it was commenced". This delightful book, a model of what a science book for the general reader ought to be, displays Mrs Maunder's own style and interests. In the space of a few hundred pages the essentials of astronomy and astrophysics as understood at the time are lucidly expounded. The highly readable text is spiced with literary quotations and imaginatively illustrated with photographs and drawings, including Annie's own photographs of the solar corona taken in India and at Mauritius. On the subject of the planets, the much discussed canals of Mars were given short shrift: both Maunders had taken their stand against the proposition that there were man-made water-carrying structures on our neighbouring planet. A separate article by Annie Maunder elaborates on these deceptive Martian features[50].

7.4 Researches into the history of astronomy

A subject which Annie Maunder was to make very specially her own - the history of ancient cosmologies - first makes its appearance in her husband's book, The Astronomy of the Bible, published in 1908[51]. Both the Maunders were deeply versed in the writings of the sacred scriptures; much later (in 1923) Annie was awarded the triennial Gibson Prize by Girton College Cambridge for an essay on a biblical topic[52]. The book discusses and explains numerous astronomical allusions in the Old Testament, and is reported to have earned the commendation of the Rabbi, the Pope and the Archbishops of Canterbury and York[53].

Among astronomical matters examined was the origin of the constellations: from a study of the uncharted regions of the southern sky the position of the south celestial pole as well as the geographical latitude of the original mapmakers could be deduced. Taking precession into account, the date of the first mapping of the constellations was calculated to have been made about 2700 B.C. from a location of latitude about 37 degrees north. Maunder's result was the first serious attempt to work out this important date[54].

In 1910 the Maunders wrote a joint paper on the origin of the planetary symbols, an interest triggered by their study of old astronomical texts in the library of the Royal Observatory at Greenwich[55]. Virtually all of Annie Maunder's later work, with herself as sole author, was dedicated to researches of a similar kind. An especially detailed study (using translations) of astronomical allusions in Iranian and Indian sacred texts was the subject of a lecture delivered to the Victoria Institute in London in 1916[56]. The Victoria Institute, which still flourishes, was founded in 1867 to examine the re-

lation between science and religion from the Christian point of view[57]; with a membership of 600 men and women, the Institute had many distinguished scientists in its ranks including the astronomers Sir David Gill, Sir Frank Dyson, Sir A.Fowler and E.W.Maunder who was the secretary. Being a reluctant public speaker Mrs Maunder's lecture was delivered by her husband; Sir Frank Dyson, the Astronomer Royal, took the chair. Though modern scholars would not go along with all Mrs Maunder's conclusions, her paper displays a vast amount of research in what was then a little-studied field. Twenty years later she was still contributing to the same journal on the topics of Hindu astronomy and the cosmology of the Rigveda[58].

In another paper (1933) Mrs Maunder compared the Indian and Egyptian zodiacs[59], and in yet another (1935) discussed Maori astronomy in New Zealand[60]. She also looked into cometary records in the writings of the seventeenth century English traveller and explorer Peter Mundy[61] and wrote an astronomical appendix to a new printing of his travels. In 1936 she returned to the subject of the origin of the constellations when in a paper in the Observatory she revised her estimated date of the establishing of the present constellations as 2900 ± 100 BC[62], a date which agrees well with modern opinion.

The large volume of her historical work put Mrs Maunder ahead of her time in the now popular field of ancient and archaic astronomy. In her lifetime she was looked upon as an expert on this subject; it is to be regretted that her efforts have not been sufficiently appreciated by later generations.

7.5 Professional life once again

In 1914 the first World War broke out, and the Royal Observatory, in common with many institutions, found itself short of staff as its male workers left on active service. In 1916 Walter Maunder, now retired, was recalled to his old post in charge of the Greenwich sunspot records. His wife joined him as a volunteer (i.e. without salary) in the solar department[63]. It was appropriate that in 1916 Mrs Maunder could at last be made a Fellow of the Royal Astronomical Society on her husband's nomination, the ban on women Fellows having finally been lifted in 1915. The Maunders kept up the solar work until 1920, well after the end of the war.

Maunder died in 1928 after a long illness. Annie, though bereft of her partner of 33 years, continued to devote herself to the work of the British Astronomical Association and to her historical researches, as recorded in the previous section. She survived her husband by almost twenty years, and died in London on September 15, 1947 in her eightieth year.

8 Acknowledgements

I owe many debts of gratitude to friends who have helped me trace the lives of these remarkable women. I may mention in particular Miss Sheelagh Grew, Armagh Observatory; Mr Alan Maunder (great grandson of E.W.Maunder); Mr Adam Perkins, archivist, Royal Greenwich Observatory; Dr Kate Perry, archivist, Girton College, Cambridge; Mrs Barbara Strachan who kindly provided me with the results of her researches into the later career of Alice Everett; Mr M.A.M. Smallman, Sub-librarian (Arts and Special Collections), Queen's University, Belfast; Miss Sue Osborne, archivist, National Physical Laboratory; Miss Clare Colvin, archivist, Royal Television Society; Mr A.Bridgewater OBE and Mr Ray Herbert of the Royal Television Society and former associates of John Logie Baird (Mr Bridgewater recalls Miss Everett from this period, though he did not know her personally; he also remembers hearing a lecture on astronomy given by her at his preparatory school in about 1921). The photograph is reproduced by permission of the Mistress and Fellows of Girton College, Cambridge.

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Annie Russell in 1886 (on right)