CAROLINE HERSHEL: AGENCY AND SELF-PRESENTATION

by

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Caroline Herschel was rare among her female contemporaries in gaining public recognition for her work in science, yet her role in this process and her role in designing her training have never previously been studied. We know that access to education and participation in science was different for men and women in the eighteenth century. However, drawing on feminist, pedagogical and biographical approaches to history, I argue that although access depended on a variety of factors, a more consistent gender divide came in lessons on how to learn, and in what was regarded as appropriate behaviour. Caroline’s skill—so often misunderstood—was to be aware of the differences and to use them to her own advantage.

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‘I found I was to be trained as an assistant Astronomer’, Caroline Herschel remarked in 1782 with no great enthusiasm.¹ In the years that followed, Caroline’s training led her to become a celebrated figure throughout Europe. By presenting this turn of events as something unwelcome, imposed upon her, Caroline carefully distanced herself from any suggestion of personal ambition. Her subsequent actions, which show her pursuing her scientific education and reputation in various ways, rather undermine her claims. As Paola Bertucci recently observed, unmarried learned women in the eighteenth century, especially those unprotected by class, needed to take great care in their self-presentation.² Women devised different strategies for working within these societal restrictions, depending on their social and geographical position.³ In this article I bring recent debates within the history of pedagogy to this discussion, to consider how training helped to determine the types of role taken and how they were presented. Caroline, as I show here, learned to be aware of the restrictions of her gender and class, and consciously devised strategies for both developing her education and presenting her work in respectable terms.

The process of understanding a historical role for women in science has gone through many incarnations. Few, if any, eighteenth-century women fit neatly into the traditional heroic tales of genius. Partly, as Londa Schiebinger has shown us, this was because
'proper' science was defined as much by who did it as what it constituted, with women’s contributions deemed, by their very nature, unscientific. A hangover from this can still be seen in writing on Caroline Herschel, in which the value of her contribution is often debated. Early studies of eighteenth-century scientific women, using this heroic model, typically presented their subjects as dutiful assistants whose contribution was unfairly obscured, or as pioneers, heroine equivalents to the archetypal heroic genius. A more subtle approach is now being taken.

Through the work of Bertucci, Findlen, Zinsser, Schiebinger and others, a picture emerges of women throughout Europe making use of resources and working within existing restrictions to carve out a life for themselves in science. Through these studies strategies emerge, as does a sense of the societal codes of conduct that made their experience, and importantly their presentation of their work, qualitatively different from those of their male contemporaries. This need to present their work modestly and self-effacingly has had serious repercussions in how history has treated these women.

Eighteenth-century women, as has been well documented, were reliant on the men in their lives for their access to education and participation in science. However, recent work on technicians and assistants has shown that this reliance on better established contacts was true for men, too. Similarly, research in the history of pedagogy indicates that access to science education in the eighteenth century was for both sexes a matter of cultivating the right networks.

As Andy Warwick and David Kaiser conclude in Pedagogy and the practice of science, nineteenth-century and twentieth-century men aspiring to become scientists and engineers ‘had to learn how to speak and act as scientists and engineers. There was nothing automatic about this process, nor did it unfold the same way across time and space.’ They needed to learn these skills from other practitioners of science by immersing themselves in the culture. Science only counts as science to other practitioners if it is presented in certain ways; Warwick and Kaiser have shown that those rules need to be learned. For men of science in the eighteenth century the rules were different from those followed by the nineteenth-century and twentieth-century actors observed by Warwick and Kaiser. For these earlier practitioners, there was less sense of science as a profession and more emphasis on gentlemanly qualities. Mariangela Ardinghelli and others have shown that the rules were different still for women. This raises the question: How did women learn them? Taking a holistic or biographical approach, and using Caroline’s story as a case study, I here show two things. I show how Caroline, as a woman, came to learn a qualitatively different approach to scientific practice from that of her brothers. At the same time, I show how she learned the rules of presentation, and how these applied differently to women, and how this, in turn, allowed her to present her work in such a way as to be taken seriously by the scientific elite.

One final problem worth mentioning here is the problem of romanticized accounts. Judith Zinsser described her task of recovering Madame Du Châtelet’s story as having been made additionally difficult because of ‘the need to counter all the half-scholarly, half-popular-romance versions of Du Châtelet’s history’. Every previous biographer, she states, felt the need to ‘linger’ disproportionately over Châtelet’s affair with Voltaire. Similar problems hang over Caroline Herschel: biographers have romanticized her childhood, presenting her as a Cinderella-like figure, and casting her brother, William, as her heroic prince. The result is that many details of Caroline’s circumstance and agency are obscured. We get little sense, for example, of what her story can tell us about the female
process of learning and gaining recognition in science in the late eighteenth century. It is this story that I set out to recover in this article.

HANOVER (1750–72): A FEMALE STYLE OF LEARNING

Caroline grew up in Hanover with five brothers, all of whom were being trained by their father to become expert musicians. Their education was about gaining expertise. Caroline’s, in contrast, was about the acquisition and execution of a broad range of skills. Although a story of Caroline’s childhood in Hanover has been told many times, little has been said about Caroline’s agency within the story or how her situation can be understood historically. Instead, a disproportionate emphasis has been placed on the personalities of her parents, as extrapolated from a small number of references made by Caroline in old age.

Caroline’s family was not well off. Her father was an army musician, often away for long periods, although he aspired for his sons to rise higher and become Court musicians. They moved house frequently for financial reasons, sometimes sharing with other families, and her mother sometimes took in work, such as sewing, to supplement the family income. It is within this context, rather than against some kind of abstract ideal, that her parents’ behaviour should be judged. Yet Anthony Turner writes, ‘Thanks to her mother’s opposition overriding the wishes of her father, Caroline was denied any kind of polite education.’ Michael Hoskin, meanwhile, insists that Caroline’s mother saw her ‘as a permanent source of cheap help at home’. He continues that Caroline was ‘the sole remaining supply of cheap labour in the home’ and would remain so forever if Anna (her mother) had her way. The terms ‘cheap labour’ and ‘household drudge’ are used often to convey a wicked-stepmother-like quality to our understanding of Caroline’s mother and her motives. They are not terms found in the primary sources. Indeed, contemporary accounts suggest that Caroline’s situation was not so very different from many other unmarried, lower-middle-class women in the region. Caroline herself simply supplies accounts of the various household tasks that she and her mother performed together. She uses the word ‘drudgeries’ once, claiming that her father never wanted her to waste her time on ‘drudgeries and laborious works’, but nowhere is this specifically linked to domestic work. The statement is open to interpretation, and in the context of education within this family more broadly she could have been referring to his wish to see all his children rise above his social class.

However, this has not stopped the wicked stepmother motif from following Caroline through many biographical accounts. Richard Holmes asserts that ‘Isaac was a natural teacher, patient and good-humoured; while Anna was quick-tempered, opinionated and scornful of what she regarded as bookishness.’ Claire Brock states that Caroline’s ‘attempts to improve herself were blocked all the way by Anna, who wanted to keep her unpaid housekeeper’ and that the ‘weak and gentle Isaac was roughly overruled by his vulgar wife and Herschel was permitted only to improve “useful” elements of her education.’

All of these strong claims show a surprising lack of sensitivity to historical detail. All insist that Anna was acting out of cruelty, whereas Isaac was indefatigably good and encouraging, the conclusion apparently being that had it not been for the personalities of these two, William and Caroline’s education would have been identical. These colourful descriptions of personality, however, give no sense of the historical context for this couple’s choices.
To understand Caroline’s education and her role in shaping it, we must begin by looking at the resources that the family were able to draw upon, and contemporary ideas regarding female education. The reformation in sixteenth-century Germany had radically transformed education, making this collection of loosely connected states some of the first in Europe to introduce universal education.\textsuperscript{21} As part of this movement the Prussian Military established its own ‘Garrison Schools’, providing the children of military men with lessons in reading, writing, mathematics and religion.\textsuperscript{32} Although universal education was the ideal, there was nonetheless a gender and a class divide in the education provided, based on each child’s expected future. For girls, this meant a predominance of domestic skills taught at home and in school, which were subdivided again in terms of class. Lower-class girls had the opportunity to learn skills that might help them find work outside the home. Girls from the middle (or aspiring) classes were encouraged to learn ‘accomplishments’, skills that had no practical use but nevertheless demonstrated skill in decorative and morally uplifting activities.\textsuperscript{23}

According to Sheilagh Ogilvie’s detailed study of women’s lives in early modern Germany, although parents were required by law to send their daughters to school, they were not required to provide them with an education equal to that of their brothers. Many guilds expressly prohibited their members from training or employing daughters in their craft, and it was not uncommon for unmarried women to remain in their parental home until they were in their forties. For those seeking employment outside the home, the choices were limited—becoming a maidservant was the most common—and very insecure.\textsuperscript{24} Ogilvie’s women talk of earning a ‘bitter living’, in or out of the home. It is in this context, of limited, unappealing choices, that we need to understand Caroline’s education and her later concerns over her future.

Caroline’s accounts of her childhood show an intensive daily routine. Her schooling meant that she learned to read and write, unlike many women from the generation before her. It is typical of Caroline’s education that this skill was immediately put to use writing letters for her mother and other illiterate army wives in their neighbourhood.\textsuperscript{25} Other skills, too, were quickly mastered and applied. These included cooking, cleaning and needlework (she describes at one point helping her mother to fill an order for army tents and linen).\textsuperscript{26} She was sent to tutors after school to learn knitting and how to clean silk. Where opportunities arose to gain new skills, Caroline actively sought to capitalize on them. She took instruction in dressmaking and in ‘ornamental and fancy works’ from a young woman with whom her family were sharing a house for a while.\textsuperscript{27} This involved ‘meeting at daybreak’ so as to fit the lessons around their respective duties.\textsuperscript{28}

She persuaded her mother to let her take millinery lessons; her mother in turn persuaded the teacher to let her do so at a reduced rate.\textsuperscript{29} In this class Caroline described mixing with ‘several young ladies of genteel families’ whom she contrasted with herself, a student ‘on rather reduced terms’.\textsuperscript{30} Whereas other areas of her education were designed to train her in very practical, applicable skills, the lessons she sought out seem to fall into a different category, one that might be described as the female equivalent of her brothers’ education. Her brothers were taught to be musicians of a higher social standing than their father. Caroline can be seen here carving out a training that might give her a higher social standing than her mother’s.

Some of Caroline’s educational aspirations were thwarted. When a cousin came to stay, Caroline complained of having to share her room and so lose ‘that little interval of leisure I might then have had for reading, practising the Violin, etc.’\textsuperscript{31} In 1761 she described her
father as having been for once ‘comfortably’ employed, had it not been (referring to her siblings) for ‘too many relying on one man’s exertions for their imaginary wants.’ In the same passage she described her mother refusing to allow her to study French, and her brother Dietrich being refused dancing lessons. Not being allowed to learn French annoyed Caroline particularly, because it destroyed her chances of becoming a governess. Although these attempts were not successful, they demonstrate Caroline’s aspirations.

Where were girls in this environment to go when they left their parents’ home? Ogilvie suggests that ‘one option was to live in the households of relatives’. In 1771 Caroline, then aged 22 years, began to wonder where her future lay. ‘I had by this time imbibed too much pride for submitting to take a place as a Ladies maid, and for a Governess I was not qualified for want of knowledge in languages’, she wrote. Her father, she added, had cautioned her ‘against all thought of marrying, saying as I was neither handsome nor rich’. With marriage, service and teaching all ruled out, Caroline’s options were extremely limited. William’s offer, to bring her to England to act as his housekeeper and learn to become a singer, gave Caroline an option she could take.

Caroline’s childhood upbringing was very different from her brother’s, not only in the subjects she studied but in how she was actually taught to learn. Whereas William and her other brothers were taught to master a single subject (music), with intensive, concentrated practice, Caroline was taught how to pick up skills very quickly, and to put them to use in a way that was useful to her family. This approach characterized Caroline’s attitude to learning throughout her life. At the same time, we can see Caroline’s ambition emerging. The lessons she sought for herself were those that might make her, and by association her family, appear of a higher social standing than the generation before them. These lessons could in some families have led to paid employment; however, in the Herschel home such ambitions were forbidden. When for example she had been allowed to attend lessons in millinery and dressmaking it was under the strict understanding that it should be to make clothes and linen for her and family only. To train girls for work outside the home was considered very much a lower-class pursuit, and this, it would seem, was not the Herschels’ aim.

BATH (1772–81): BETWEEN DOMESTIC AND PUBLIC WORLDS

Between 1772 and 1781 Caroline lived with her brother in Bath. William had moved there in 1770, having found himself a secure and permanent position as a musician. Once established, he had sent for his younger brother Alexander, and in 1772 Caroline was brought over too. In this nine-year period Caroline learned to speak English and to sing. The initial intention was that she might train either as a music teacher or as a singer for William’s concerts and oratorios. Her subsequent training suggests that the latter was more likely, and certainly that is what she ended up doing. While in Bath, Caroline was given lessons in presentation, to learn how to perform and behave among employers of musicians. As a consequence she learned some of the rules of appropriate female behaviour that she would later apply in the presentations of her science.

At the same time Caroline was still pursuing her own education. Although she now had a purpose, she was still in a vulnerable position. Without proving herself indispensable there was still every danger she would be sent home; that was, after all, the agreement that William had made with their mother and their brother Jacob back in Hanover. William may have
initiated some lessons, but Caroline’s skill was in persevering and identifying what she might need to learn (and learn quickly) to become more indispensable to her family. The lessons began almost as soon as she arrived in Bath. Initially they focused on acquiring the skills she needed for her new role as a singer and English housekeeper: ‘I had 2 or 3 lessons every day, and the hours which were not spent at the harpsichord were employed in putting me in the way of managing the family.’ Lessons began at breakfast, where William ‘began immediately to give me a lesson in English and arithmetic.... The remainder of the forenoon was chiefly spent at the harpsichord; shewing me the way how to practise singing with a gag in my mouth.’

After her initial six weeks in England, with the Bath season approaching, William’s attentions moved elsewhere, to music lessons and public performances. Caroline was forced to improvise, inventing her own lessons. She thus set about using this time to make herself more indispensable to her family: ‘I began to think on how those hours I should now be left to myself might best be spent, in learning what would become necessary to know for a housekeeper of our little family.’

Here in Bath, Caroline was also required to learn a new set of social and presentational skills. To this end William introduced her to ‘two ladies both very great critickers on singers and musical performers’, and arranged for them to take her to London. They stayed for six weeks, during which time Caroline was taken to the opera and the theatre numerous times, and to auctions and shopping. Although a little overwhelmed by the experience, and glad to be back in Bath, she did note in her autobiography that ‘to her (Mrs Colbrook) and to the Marchioness of Lothian I am indebted for all I ever saw of the Fashionable world.’ At about the same time Caroline also learned an important lesson in self-presentation that she took to heart. She was told off for ‘being my own Trumpeter’ by a lady in Bath, and from this point on seems to have taken exaggerated steps to avoid any future accusations of self-aggrandisement.

Seeing the fashionable world was only part of Caroline’s training. In addition William employed a tutor to provide her with a more structured and formal education in presentation skills. ‘As I was to take part in the Oratorios, I had for a whole year two lessons a week by Miss Fleming, the celebrated dantzing Mistress, to drill me for a Gentlewoman.’ With the help of these three women—Mrs Colnbrook, the Marchioness of Lothian and Miss Fleming—Caroline learned the skills needed to present herself in polite society as a performer and a gentlewoman. That William brought in women friends and acquaintances to help Caroline master these skills shows his (and their) awareness that these skills were gender specific. He had learned how to behave among his musical clients gradually, through experience and practice. Caroline needed to master subtly different skills and, as was so often the case in her education, to master them quickly, ready to put them to use.

Mrs Bulman, the housekeeper, had helped Caroline master English cooking. Teachers had been employed to teach her etiquette and presentation. William had helped her learn English, singing and some basic accounting. Next the siblings turned their attention to other areas of mathematics. After her initial accounting tutorials, Caroline’s mathematics lessons evolved into something quite different. These ‘Little Lessons for Lina’ as they were called, subheaded ‘A little Geometry for Lina’, ‘A little Algebra for Lina’, and so on, started with algebra and geometry, including topics such as angles in a triangle and z-angles. Both algebra and geometry were considered essential prerequisites for the study of fluxions (an area of mathematics that William was then studying). The lessons also
incorporated some of the astronomy that William was beginning to study. In one lesson, for example, certain trigonometric rules were taught; in the next, astronomy-related problems were set in which those rules might be used, such as finding the position of one star in relation to another.

William’s education in mathematics and astronomy had followed a similar structure to these lessons. Like Caroline he had needed to master algebra and geometry to progress on to fluxions. Such subjects were rarely studied by school children—even the army did not require knowledge of as much algebra as Caroline was now learning.49

It is unclear who initiated these lessons or why, although several possible reasons suggest themselves. For William, teaching Caroline offered him the opportunity to test how well he understood what he had learned so far. This was a style of learning he had been taught as a child. In addition, having a sister with some knowledge of advanced mathematics would have added to his family’s reputation as Bath’s mathematical musicians. For Caroline, her acquisition of mathematical skills allowed her to play a greater role in William’s life and work, thus further securing her position in her new family home.

About a year after Caroline arrived in Bath, in the summer of 1773, William began a new hobby, building his own telescopes, that entirely changed the look of the house and the life of its inhabitants: ‘It was to my sorrow I saw almost every room turned into a workshop’, Caroline declared with regret.50 Although initially appalled at what this meant for the house, Caroline later recognized the educational opportunity offered to her through this new hobby, and took advantage of it. At first, however, her role in instrument making was minimal; her musical and domestic duties took precedence.

Throughout this period both William and Caroline were using their ability to absorb skills and knowledge to develop new roles for themselves. While William was gradually becoming more astronomer than musician, Caroline was busy making herself indispensable in every area of William’s life. First she became an assistant to William the musician, not just as a singer (as had been originally suggested) but in all aspects of his musical life. She learned the rules of presentation and female modesty, but importantly she learned them in the context of performance. These lessons were not designed to discourage participation in the public sphere, but rather to teach her how, as a woman, she must manage her appearance and reputation.

**TELESCOPE TRAINING (1781–86): ASTRONOMY AND MATHEMATICS**

In 1781 William Herschel discovered the planet Uranus, and thanks to the work of his supporters in London he was given a King’s pension. For this he was required to move to a house nearer Windsor and be on call to show the Royal Household the heavens whenever they wished. The pension was generous enough to allow William to take Caroline with him, and so the two of them packed up and moved to Slough. They moved several times in the first few years before eventually settling on a property later known as Observatory House. On arriving in their new home, Caroline states:

> I found I was to be trained for an assistant Astronomer; and by way of encouragement a Telescope adapted for sweeping… was given to me. I was to sweep for comets…. I began Aug 22, 1782... but it was not till the last two months of the same year before I felt the least encouragement for spending the starlight nights on a grass-plot covered by dew or hoar frost without a human being near enough to be within call.51
She swept for comets. The domestic analogy here is impossible to avoid, although it was only one of the ways in which her domestic training impinged on her approach to astronomy. More fundamental was that her domestic training so far had taught her to gain and apply skills quickly, and to fashion innovative ways of making her indispensable to her family.

In instrument making, Caroline’s approach to education showed itself to be a good complement to that of her brothers William and Alexander, helping them to work as a unit. Whereas each brother learned and perfected a specific aspect of instrument making, Caroline learned enough from both brothers to fashion her own distinct role as translator. William made mirrors and was interested in the final product. Alexander had no interest in astronomy but was concerned with the mechanics of the designs, the clockwork elements and the detailed metalwork such as the manufacturing of eyepieces. In a letter written from Bath by Alexander to William in 1785, for example, he tells him:

I send you here a description . . . it will perhaps assist you to understand my plan of the Bell machine. I do not wunder at your not being able to make anything of it, for after I had with a great deal of pains finished it, I could hardly understand it myself when I came to read it over, but I think if you was to get Carolina to read it over and see what she can do for she is perhaps better acquainted with my round about way of describing things. 52

The letter preceding this quote is full of intricate detail about clock design. Alexander’s faith in Caroline’s ability to understand it suggests that her capacity to learn and apply knowledge quickly had found an unexpected outlet. It allowed her to fulfill this often unrecognized role of technical interpreter. In a similar role, she helped turn William’s ideas about his telescope mirrors into reality, by supervising the workmen when William was away.

Having carved out a role for herself within the family’s instrument-making project, Caroline then began to take more control over other aspects of her education. In this period she actively pursued an understanding of the mathematics and astronomy that her brother was studying. Her ‘little lessons for Lina’ became answers to her questions to her brother.

From a set of papers that Caroline described to her nephew as containing ‘chiefly answers of your father’s to the inquiries I used to make when at breakfast, before we separated, each for our dayly tasks, &c. &c.’, a new stage in her mathematical and astronomical education is evident. This was a continuation of the ‘little lessons for Lina’, but here her phrasing makes the identity of who initiated them far less ambiguous. Caroline was now setting the topics herself, selecting areas of mathematics that she felt she needed to study, and quizzing her brother. The content, however, suggests that the questions came out of the broader tasks set by her brother. Her notes contain, for example, ‘Theorem for determining the field of view by the passage of a star’, ‘Rules for making use of astronomical instruments’ and ‘Theorem for calculating the number of stars that have been seen in a sweep’. In each of these sections it is possible to see a direct correlation between the rules and theorems laid out and the tasks she was assigned in her new role as William’s astronomical assistant. 53

Gradually the dynamic shifted as William’s latest theories began to creep into her lessons. On one page, for example, Caroline was introduced to ‘The 8 classes of Nebulae’ and ‘The 6 classes of Double Star’. This was from a new classification system devised by William. Caroline’s notes suggest that these lessons offered an opportunity to test out and talk through his new ideas. Although not dated, an entry towards the end of this set of papers is entitled ‘Eccentricity of planets and asteroids’. 54 The terminology dates it to after 1801 (when the first asteroid was discovered), suggesting that these lessons were ongoing but irregular. There were often long gaps of several months between lessons. This also
introduces an interesting contrast between William’s attitude to Caroline’s education and to his son, John, who in 1801 was nine years old and at school.

John was taught to follow in William’s footsteps, but with an improved education designed to overcome William’s perceived failures and shortcomings. In essence, this was the same style of education as William had received: it was teaching expertise. Caroline, meanwhile, was trained to learn a wide range of skills, each expected to have an immediate application. She sought out new lessons all the time but was only fully supported by her family in those that made her more useful to them. When for example their friend, the French mathematician Joseph-Jérôme Lalande, passed on compliments to ‘the learned Miss Caroline’ from ‘Mad. du Piery who is the only female astronomer in France’, Caroline had William reply:

on behalf of my sister to give my best wishes to Mad. du Piery and to tell her that she would feel only too happy to be already able to do fluxional calculations, as she hears her fortunate rival can do at present: but following so glorious an example she will constantly beg her brother to teach her that sublime science.

Caroline may have wanted to learn more, but with no obvious immediate application, her family was not always cooperative.

Caroline tried her best to gain an education comparable to that of her brothers; however, she did not have the luxury of being able to focus on one single area and so reach an equivalent level of expertise. Instead she compensated for this by learning a range of subjects to the level at which they might be applied quickly. This was the style of learning that Caroline had been brought up with, and resourcefully she managed to find a way of using this skill to carve out a role for herself within the family enterprise. She could help her brothers communicate, enabling them to collaborate successfully on telescope building. She could also be relied upon by William to turn her hand to any new skill he might need her to master, making her the perfect assistant.

COMETS AND CATALOGUES (1786–97): PUBLIC IMAGE AND RECOGNITION

Between 1786 and 1797 Caroline Herschel discovered several comets and worked on a reorganization of John Flamsteed’s star catalogue. Both projects gained her public recognition and praise within the astronomical community. ‘Remarkably’, as Iliffe and Wilmoth have already observed, ‘Caroline’s work elicited none of the condescension experienced by women in the previous century.’ This, I suggest, was less to do with timing and more to do with Caroline’s carefully crafted public image. It was during this period that Caroline was able to put all her training into practice. She was able to use her practical and theoretical knowledge to aid her brother in his astronomical work, both directly and by devising projects to work on independently. At the same time, her understanding of appropriate modes of conduct and female modesty, mixed with a background in performance, meant that she knew just whom to tell of her independent achievements and how best to present them.

It is this period of Caroline’s life that has attracted the most controversy about her contributions to science and their value. Her comet discoveries have been used as evidence of her importance as an astronomer in her own right, but they have also been used as evidence of her inadequacies. As Hoskin writes, ‘we look in vain in her
manuscripts for any hint of interest beyond the mere act of discovery’. This conclusion defines astronomy very narrowly to be the calculations and theorizing following discoveries. This is despite evidence to suggest that William similarly handed over his discovery of Uranus for others to study further. More persuasively, Patricia Fara suggests that Caroline’s greatest contribution to science was her cataloguing work, stating that ‘methodical work lies at the core of scientific progress, yet we still celebrate the unusual, the breakthrough, the single spectacular event.’ In this context William’s reputation can be seen in large part to have been dependent on Caroline’s organizing ability and attention to detail, of which her catalogue was a clear and public example. This article, however, is not about assigning value to Caroline’s work, but rather about understanding how it came about within the context of her education and her skill in presenting it for maximum effect.

Caroline’s catalogue came out of her rearranging of Flamsteed’s star catalogue into a list of stars by zone (rather than constellation) so that her brother might use it in his zonal sweeps of the sky. This was, as she put it, a project that would give her something useful to do when William was busy. ‘I had always in hand some kind of work with which I could proceed without troubling him with questions, such as the Temporary Index which I begun in June 1787, and some years after, the Index to Flamsteed’s observations.’ This followed her standard justification for activity. It was work that would make her more useful to her brother. Yet on Maskelyne’s suggestion that it should be published, she wrote:

I thought the pains it had cost me were and would be sufficiently rewarded in the use it had already been, and might be of in future, to my brother. But your having thought it worthy of the press has flattered my vanity not a little. You see, Sir, I do own myself to be vain because I would not wish to be singular, and was there ever a woman without vanity?—or a man either? Only with this difference, that among gentlemen the commodity is generally stiled ambition.

Caroline’s biting comment on vanity and ambition show her awareness of the different ways in which men and women were expected to present themselves so as to gain acceptance. She understood this, and used it not only in presenting her catalogue to Maskelyne but also in ensuring that her name was attached to several comets.

Like her catalogue, Caroline’s comet discoveries came out of work she was doing with her brother. His project—to survey the sky for nebulae, star clusters and double stars—was an update of a catalogue originally produced by Charles Messier to identify and list these objects for the benefit of comet hunters because such objects were frequently mistaken for comets. Caroline’s comet hunting was this project in reverse. It was about learning to tell the difference between one blurred object in the night sky and another.

Caroline discovered her first comet on 1 August 1786, the next in December 1788, two more in 1790, a fifth in December 1791, another in October 1793 (alas, previously seen by Messier) and her seventh in November 1795 (later found to be a reappearance of Encke’s comet); and in August 1797 she discovered her eighth and final comet. The details of each discovery have been discussed elsewhere. The timing of these discoveries, as Claire Brock points out, almost all occurred when William was away. The discoveries then abruptly stopped in 1797 when she moved out of Observatory House.

Once each discovery was made, Caroline or her brother made it known, and a paper was read on her behalf to the Royal Society. Caroline’s approach, the language she used, and her actions, all illustrate the tension between wanting to claim priority and the need to conceal
that desire in non-ambitious terms. Of one comet announced to Maskelyne she begs ‘the favour of you to take it under your protection.’ On another occasion she asks Sir Joseph Banks, President of the Royal Society and a keen supporter of her brother, to make her discovery more widely known, ‘for the sake of astronomy.’ On discovering her eighth comet, she got on her horse and rode through the night to Greenwich to ensure priority. In each case she passed on the information to prominent members of the scientific community and left them to deal with the details, carefully presenting herself as the discoverer and yet doing so with appropriate modesty and self-effacement. Her choice of recipient is a topic that warrants further investigation but is beyond the scope of this article. On the one hand she chose the same men whom William approached with his discoveries. On the other, she seems to have chosen individuals who were particularly accepting and encouraging of learned ladies.

Unlike other celebrated male–female partnerships in science, the Herschels made little attempt to share credit for their work. There were no joint portraits commissioned of the pair showing them at work, as there were for the Heveliuses or the Lavoisiers. Instead, in this family, Caroline’s contribution—although not Alexander’s, nor that of any of the many unnamed workmen—was clearly acknowledged. That they were brother and sister rather than husband and wife perhaps goes some way to explaining this difference. Another plausible factor was their musical background, in which public recognition for each individual contribution was standard.

Caroline, with the support of her brother, was glad to receive recognition for the discoveries she made and for her cataloguing, both of which came about through her work within this scientific family. However, that is not the same as saying, as Brock has argued, that she worked her whole life towards recognition and paid work. Her motivation, as far as can be inferred from the evidence, was to play an integral role within William’s astronomical project, to make herself indispensable to him and give herself something interesting to do. Within that framework, when she produced something that could reasonably be described as her own work, she was keen for that to be acknowledged and aware enough of her position to know how that might be achieved. She was ambitious, as she almost tells Maskelyne, in the sense that she actively sought recognition and credit. At the same time she was not ambitious for independence. She was part of the Herschel family project, but within that she saw no reason not to announce her specific role and achievements.

CONCLUSION

As Bertucci has observed, a learned woman in the eighteenth century needed to be careful of her self-presentation so as to avoid ridicule and social isolation. And as we have seen elsewhere, a woman’s access to a scientific education was often extremely limited. Caroline’s example shows how these limitations could be managed, and how strategies could be devised to gain a scientific education and acceptable public reputation. Caroline, with the help of her brother and his friends, was able to build on the basic structure of her typically female childhood education and turn it into something scientific. Previously she had learned to master reading, writing and a range of domestic skills quickly for immediate application. Once in England she applied this same learning style to language, music and performance, and eventually to mathematics, instrument making and astronomy.
Few women managed to gain an acceptable public reputation in science, although work on scientific couples and on ‘invisible assistants’ has shown that large numbers participated. It would then be a mistake to assume that a desire to gain such a reputation and knowledge of how to go about it was common to all. Caroline’s example shows one way in which such things might be learned. As a newcomer to England and an outsider to the social class that her brother served (as a musician), Caroline had to take lessons in what were appropriate modes of self-presentation. She learned these in the context of performance, which taught her not only what was acceptable but also that credit for one’s role should be expected. She learned in this context that she was expected to show modesty, but not that this modesty should make her invisible. Rather, these lessons taught her how to manage her public image.

Eighteenth-century women had to rely on the men in their lives for access to scientific work and education, and in this sense Caroline was typical. However, this barrier to participation, which meant that Caroline’s lessons came from her brother and that her papers were read at the Royal Society on her behalf, did not prevent her from taking an active role in shaping her education and public image. Although she was helped in this by her brother, he did not do it all for her.\textsuperscript{72} To make her education and participation meaningful, she had to carve out a niche for herself, pursuing certain lessons and identifying tasks that needed doing. Out of this came her role as technical interpreter, translating between her two highly specialized brothers, allowing them to communicate and so build telescopes together. Out of it, too, came her catalogue and her comet discoveries.

By looking at Caroline Herschel’s education and self-presentation in their own terms, we can gradually distance ourselves from any need to justify or judge her contribution in terms of what Hunter and Hutton have termed the ‘“great men” account of the history of science’.\textsuperscript{73} Instead we see Caroline, like her brother, working within the confines of her situation to build a highly prized education and reputation in astronomy.

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\section*{Notes}

\begin{enumerate}
Caroline Herschel


4 L. L. Schiebinger, The mind has no sex?: women in the origins of modern science (Harvard University Press, Boston, MA, 1989).


5 Point made by Lynette Hunter and Sarah Hutton in L. Hunter and S. Hutton, Women, science and medicine, 1500–1700: mothers and sisters of the Royal Society (Sutton, Stroud, 1997).


11 Du Châtelet was a mathematician, physicist and author, best known for her translation into French (with commentary) of Isaac Newton’s Principia Mathematica. Zinsser, op. cit. (note 7).


14 Hoskin, op. cit. (note 5), p. 11.


16 M. Hoskin, op. cit. (note 1), p. 29.


18 Brock, op. cit. (note 5), p. 52.

19 Ibid., p. 53.


22 Ibid., p. 58.

23 Ibid.

24 Ibid. (note 16).

25 Ibid.

26 Ibid.

27 Ibid.

28 Ibid., p. 114.

29 Ibid.

30 Ibid., p. 42.

31 Ibid., p. 44.
32 Ibid., p. 34.
33 Ibid., p. 55.
34 Hoskin, op. cit. (note 1), p. 46.
35 Ibid., p. 47.
36 Hoskin, op. cit. (note 5), p. 11.
37 Petschauer, op. cit. (note 22).
38 Hoskin, op. cit. (note 1).
40 Ibid.
41 Mrs J. Herschel (ed.), Memoir and Correspondence of Caroline Herschel, p. 32 (John Murray, London, 1876).
43 Ibid., p. 55.
47 The pairs of identical angles formed when you make a z shape from two parallel lines and a diagonal line are called z angles. Like angles in a triangle, if you are given one angle, you can work out the rest.
48 ‘The only requisite was a knowledge of algebra (but not series) and geometry (with or without trigonometry).’ Niccolo Guicciardini, The development of Newtonian calculus in Britain 1700–1800, p. 55 (Cambridge University Press, 1989).
51 Ibid., p. 150.
53 Set of papers entitled ‘chiefly answers of your father’s to the inquiries I used to make when at breakfast, before we separated, each for our dayly tasks, &c. &c.’, British Library (hereafter BL): microfilm M/588(5).
54 Ibid.
57 Also in RAS archives, reproduced in Lubbock, op. cit. (note 39), p. 252.
58 Iliffe and Wilmoth, op. cit. (note 46).
61 Fara, op. cit. (note 8), pp. 151–152.
62 Fara, op. cit. (note 8), ch. 8, Caroline Herschel/William Herschel, pp. 145–166.
63 See Hoskin, op. cit. (note 5), p. 70; Caroline L. Herschel’s MS reworking of Flamsteed’s catalogue, RAS: CH.2/1.
64 Lubbock, op. cit. (note 39), p. 171.
Caroline Herschel

68 Caroline L. Herschel to Nevil Maskelyne, 22 December 1799, in Lubbock, op. cit. (note 39), p. 245.
70 Hoskin, op. cit. (note 44), p. 142.
71 Caroline also writes to Lalande about her fourth comet, who in turn replies with congratulations and news that his niece has just been named Caroline in her honour. Caroline to Lalande, 1790, and Lalande to Caroline, 12 July 1790, RAS: W13.L. A recent paper at the 2013 International Congress of History of Science, Technology and Medicine conference in Manchester in July 2013 by Isabelle Lemonon Waxin revealed Lalande in particular to have been an encouraging correspondent of a network of now mainly forgotten learned women.
72 This is in direct contrast to the image that Holmes, op. cit. (note 18) presents us with on p. 83.
73 Hunter and Hutton, op. cit. (note 6), p. 3.