

Biographical Encyclopedia of Astronomers

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Herschel, Caroline Lucretia

Born Hanover, (Germany), 16 March 1750

Died Hanover, (Germany), 9 January 1848

Perhaps the most famous woman in the history of astronomy, Caroline Herschel discovered eight comets and was the first professional female astronomer, yet she seems destined to live in the shadow of her brother, William Herschel. Caroline was the eighth of ten children (only six of whom survived) born to Isaac Herschel and Anna Ilse Moritzen in Hanover, Germany. Isaac Herschel, a bandmaster in the Hanoverian Guard, raised his sons in a musical-military tradition. Music defined the Herschel household, though natural philosophy was frequently the topic of dinnertime conversation. In neither of these activities was Caroline an active participant, though much later she became a somewhat accommodating singer under the sporadic tutelage of William. Caroline was extremely devoted to her father and brothers, but she was especially fond of William and was heartbroken by his immigration to England when she was seven

For nine years, William worked as an itinerant musician until he obtained a position in 1766 as the organist in the Octagon Chapel in the resort town of Bath. To Caroline's great relief, in 1772, William visited Hanover and brought her back with him to

England. Caroline's fate, or at least her short-lived musical career and subsequent astronomical accomplishments, paralleled that of William

Even while he continued to write music and give music lessons to students and his sister, who joined him not only in copying music but also in giving public performances, William's passion turned to astronomy. William bought popular books on astronomy and optics, leased some small telescopes, bought equipment for making his own reflectors, and began observing the skies by early 1774. Caroline found herself working as William's assistant, helped somewhat by their brother Alexander. Under William's tutelage, she learned to grind and polish mirrors and to construct tubes. Unbeknownst to them, they were making the most powerful telescopes then available anywhere in the world, including their first 20-foot focal-length reflector built in 1776. William also taught Caroline some mathematics necessary for astronomy. By helping in so many aspects of astronomy, Caroline became by default an expert astronomer, though in her humility (and likely some bitterness) she considered herself merely an astronomer's helper

By 1779, William regularly and methodically observed the entire night sky, investigating many objects already known and discovering new ones. Soon after William's discovery of the planet Uranus on 13 March 1781, he and Caroline moved to Datchet, near Windsor Castle. As William left his musical career behind and focused on astronomy full-time, Caroline had little choice but to do the same, aiding William as he built increasingly larger telescopes, culminating with their massive 40-foot reflector, finished in 1788. William observed atop the telescopes, calling down to Caroline what he was seeing and where; she recorded those observations, copied them

the next day, and later reduced them for assembling a catalog. Although it was not her ideal profession, Caroline was so adept at the mathematics necessary for accurately recording and processing William's observations that she was soon able to undertake her own observatory program.

At William's command, Caroline began her own observations sometime around 1780, using a variety of different telescopes, including specially designed small Newtonian "comet sweepers." In the next few years, she found new nebulae, star clusters, double stars, and, most notably, comets. She discovered her first comet (C/1786 P1) on 1 August 1786, and astronomers throughout Europe soon confirmed it. The following year, King George III awarded Caroline a pension of her own, giving her 50 pounds annually as her brother's official assistant, making her the first woman paid as a professional astronomer. She discovered five more comets that now bear her name: 35P/1788 Y1, C/1790 A1, C/1790 H1, C/1791 X1, and C/1797 P1. She also independently discovered comets C/1793 S2 (Messier) and 2P/1795 V1.

Although it was not known at the time, Herschel rediscovered (in 1795) the comet that was originally seen in 1786 by Pierre Méchain. This same comet was later observed in 1818 by Jean-Louis Pons, but it was Johann Encke who first demonstrated (from the orbital elements) that all three comets were one and the same object, having a very short orbital period of around 3.3 years.

Caroline also took the information from the star catalog of the first Astronomer Royal, John Flamsteed, and compiled lists of stars in zones of declination 5° wide to assist William's sweeps of the sky as he searched for double stars and nebulae. In 1798, she published a revised version of Flamsteed's star catalog, contributing an additional 561 stars Flamsteed had not included and correcting many errors.

Caroline thus not only participated in her brother's astronomical discoveries, but was also a solid astronomer in her own right. After William's marriage in May 1788, however, Caroline felt displaced. Her own astronomical pursuits reflected her general desire to be of assistance to William; her aid on both fronts was now needed less and less, a situation furthered by her moving out of William's home. Even so, Caroline soon had a new member of the Herschel family on whom she could dote: William's son, John Herschel, born in 1792, who became one of the most celebrated 19th-century men of science. As a boy, John received considerable attention from Caroline, and his close relationship with his aunt lasted until her death.

After William's death in 1822, Caroline returned to Hanover. Over the next few years, she finished the catalog of the 2,500 nebulae and star clusters William had observed. For this work, she was awarded the 1828 Gold Medal of the Astronomical Society of London (later the Royal Astronomical Society). Caroline and John remained in regular contact through extensive correspondence, with John also visiting her on occasion. During his astronomical expedition to South Africa, John and his wife, Margaret, wrote to Caroline to keep her informed of John's discoveries. When Halley's comet returned during this period, John wrote excited letters to Caroline so that she, herself a great discoverer of comets, could be informed of his observations of it.

Caroline remained in Hanover until her death. Near the end of 1847, she received a final, important gift: a specially bound copy of John's recently published astronomical observations from Cape Town

These observations represented the completion of a survey of the entire night sky, undertaken by William, Caroline, and John in the Northern Hemisphere, and completed by John in the Southern Hemisphere. The publication brought a closure to her own years as an astronomer. A few months later, Caroline died peacefully in her sleep.

Caroline's contributions to astronomy are inevitably linked to serving as her brother's assistant and *amanuensis*. Indeed, she wrote drafts of every one of his many papers published in the Philosophical Transactions. Her comet discoveries and revision of Flamsteed's catalog earned her considerable renown in her own right among astronomers. Even there, however, she could not escape from William's shadow: Although Joseph de Lalande wished to nominate her for a prize awarded by the Assemblée Nationale in 1792, it went instead to William.

Steven Ruskin

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