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Michael Hoskin

# William and Caroline Herschel Pioneers in Late 18th-Century Astronomy



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# William and Caroline Herschel

Pioneers in Late 18th-Century Astronomy

 Springer



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# Foreword

When John Keats wrote, “Then felt I like some watcher of the skies When a new planet swims into his ken”, his literary allusion was to William Herschel, musician, composer, and conductor, who in 1781 discovered the planet that would be named Uranus. Herschel, who as an amateur astronomer had built the finest telescope then available, did what no other person alive could have done: he recognized something unusual when a peculiar bluish object with a distinct disk swam into his ken. No other person would have noticed it because his was the only telescope precise enough to show the disk-like structure. Herschel himself was more sanguine about his discovery. “It has generally been supposed that it was a lucky accident that brought this star to my view”, he remarked in a manuscript autobiography. “This is an evident mistake. In the regular manner (that) I examined every star of the heavens not only of that magnitude but many far inferior it was that night *its turn* to be discovered.... Had business prevented me that evening, I must have found it the next, and the goodness of my telescope was such that I perceived its visible planetary disk as soon as I looked at it.”

Herschel supposed his object to be a peculiar comet. Only later, after other astronomers computed its orbit, was it deemed to be the first new planet to be known since antiquity. It was a life-changing opportunity for William. The transformation was from a fashionable musician whose symphonies are still played to becoming the King’s astronomer. It was the choice between competence and genius.

Herschel’s genius was manifested in many ways. As a telescope maker his talents were unsurpassed as he built ever larger reflectors. Eventually they were coveted by crowned heads throughout Europe. But he did not just build telescopes for others. The best he kept for his own well-targeted observational projects. He almost single-handedly built an entirely new astronomical discipline, the physical arrangement of the heavens, the way the stars were arranged in a gigantic grindstone-like structure. The professional astronomers of his day viewed the heavens chiefly as a two-dimensional map against which the planets and comets marched in their stately paths. Herschel added a third dimension, their distances, or even a fourth dimension as he began to ponder their structure in time as the heavens slowly evolved.

When William moved from the fashionable musical city of Bath to the rural countryside near the King's Windsor castle, he uprooted his little sister Caroline as well, a young woman at the verge of a satisfying musical career. To relieve her possible boredom, William made a series of special small telescopes just for her, and eventually she discovered eight new comets. Rather ironically, William's only comet turned out to be a planet! But even before the comets, Caroline began to find new nebulae, and as this biography of the brother-and-sister team shows, her discoveries launched an entirely new tack for William's researches. With his 20-foot instrument with an 18-inch mirror, William began to sweep the sky for nebulae, eventually completing three monumental new catalogues, listing 2500 nebulae.

This brief biography covers in rich detail Herschel's career as the greatest observer of his century and also as a theoretician who constructed explanatory pictures of the structure and evolution of the heavens. Michael Hoskin's long exploration of the history of sidereal astronomy has given him an in-depth context for Herschel's achievement. Today, no one else knows more about the interactions of the William and Caroline team than Michael Hoskin, so it is a very great and secure pleasure to recommend this account, which is both fascinating and authoritative.

Cambridge, October 2012

Owen Gingerich

# Contents

<b>1</b>	<b>Vocations in Conflict</b> . . . . .	1
1.1	The Refugee Musician . . . . .	1
1.2	The Rescue of Caroline . . . . .	3
1.3	The Amateur Astronomer . . . . .	7
1.4	A New Planet . . . . .	15
<b>2</b>	<b>The Construction of the Heavens</b> . . . . .	19
2.1	The King’s Astronomer . . . . .	19
2.2	Stars No Longer Fixed . . . . .	20
2.3	Sweeping for Nebulae . . . . .	25
2.4	Fathoming the Milky Way . . . . .	29
2.5	Gravity as the Agent of Change . . . . .	31
<b>3</b>	<b>“One of the Greatest Mechanics of his Day”</b> . . . . .	35
3.1	The Monster Reflector . . . . .	35
3.2	Attraction by an Earthly Star . . . . .	42
<b>4</b>	<b>The Peerless Assistant</b> . . . . .	49
4.1	“Priestess of the New Heavens” . . . . .	49
4.2	The British Catalogue Revised . . . . .	52
4.3	The Second Edition of the Record of Sweeps . . . . .	54
4.4	A Family Spat. . . . .	55
<b>5</b>	<b>William’s Declining Years</b> . . . . .	61
5.1	Light Illuminated. . . . .	61
5.2	Companions in Space. . . . .	65
5.3	A Cosmogony . . . . .	67
<b>6</b>	<b>John’s “Sacred Duty”</b> . . . . .	71
6.1	The Torch is Handed On . . . . .	71
6.2	Caroline’s Return to “Horrible Hannover!” . . . . .	77
6.3	The Catalogues of Nebulae Recast . . . . .	79
6.4	“The Completion of My Father’s Work” . . . . .	81

<b>Appendix: Visitors' Accounts of the Herschels at Work . . . . .</b>	<b>87</b>
<b>Source Materials . . . . .</b>	<b>103</b>
<b>Further Reading . . . . .</b>	<b>105</b>
<b>Index . . . . .</b>	<b>109</b>



# Chapter 1

## Vocations in Conflict

### 1.1 The Refugee Musician

In August 1731 the gardener-turned-oboist Isaac Herschel (1707–1767) arrived at Hanover from his family home in central Germany, and enlisted in the band of the Hanoverian Guards. The Elector of Hanover was better known as King George II of Britain, where he resided, but in Hanover he maintained a Court and a regiment of Guards. A year later Isaac hurriedly married Anna Ilse Moritzen (1712/13–1789), an illiterate serving girl from a village outside Hanover. Anna was already pregnant and Sophia, the first of their ten children, was born six months later.

Their fourth child, Friedrich Wilhelm (1738–1822, known to us as William, the name that later became legally his by Act of the British Parliament), was brought up to be a musician, as were all the Herschel boys. In 1753 William joined his father and his older brother Jacob (1734–1792) in the band of the Guards. Soon the French threatened an invasion of Britain, and in 1756 King George summoned the Guards to England to reinforce the army there. The threat soon passed, and the Guards returned to Hanover—but without Jacob, who had little taste for army life and had already secured his discharge.

In 1757 the threat revived, and this time it was against Hanover itself. Isaac and William took part (as non-combatants) in the Battle of Hastenbeck, when the Hanoverians and their allies were defeated by the French. Isaac persuaded himself that William, a boy and not under oath, had no obligation to remain with the army, and so he sent him away to England, along with Jacob, who had been lying low in the family apartment in Hanover while French soldiers occupied much of the rest of the block.

Safely arrived in England, the two refugees survived through their talents as musicians. When peace was restored in 1759 Jacob returned home, but William remained in England. He was technically a deserter, and it would be unwise for him to set foot in Hanover until he received his formal discharge, which he did in 1762 (Fig. 1.1).



Fig. 1.1 William's discharge from the Hanoverian Guards. Photograph by the late W. H. Steavenson, courtesy of the Institute of Astronomy, Cambridge University

By then William was making a good if somewhat stressful living as an itinerant musician in the north of England, and he was composing the symphonies and concertos by which he hoped to be remembered. Late in 1766 William (Fig. 1.2) accepted an invitation to Bath in the west of England, to become organist at the Octagon Chapel then under construction. During the season, from the autumn to Easter, Bath was frequented by the aristocracy, and a talented musician could make a good living there. The chapel was a commercial enterprise, where the upper classes would rent pews and then worship their Maker in warmth and comfort. The quality of the music in the chapel was an important selling-point, and William was expected to write music for the choir and train them to cathedral standard. As organist he would receive a regular salary, and this he would supplement by his other musical activities.

In June 1767, some weeks after the death of their father Isaac, Jacob joined William in Bath to help support the family back in Hanover, and he stayed for two profitable years. In July 1770 Jacob paid another (but this time brief) visit to Bath, bringing with him their younger brother Alexander (1745–1821). Alexander was to remain in Bath as a leading cellist until ill-health forced him to retire to Hanover in 1716. His hobby was metalwork, and this would later prove to be of great value to William when he became a builder of telescopes.

**Fig. 1.2** William as a young man. This miniature (artist unknown) was probably given by William to Caroline in 1764, when he travelled from England to visit his family in Hanover. Herschel family archives



## 1.2 The Rescue of Caroline

By 1771 William and Alexander had become increasingly concerned about the fate of their youngest sister Caroline (1750–1848), who was trapped in the family home in Hanover at the beck and call of their domineering mother. Anna enjoyed having her daughter as a household drudge, and so she had prevented her from learning any skills that might enable her to make her escape. A governess of children would be expected to teach French to her charges, and so Anna forbade Caroline to learn the language. She also put obstacles in the way of Caroline's learning the more advanced needlework. Caroline (Fig. 1.3) was fearful for her future, when the brothers now living at home had married and she, a diminutive spinster disfigured by smallpox, was left behind with only her mother for company.

Her brothers contrived an excuse for her rescue by proposing that she come to Bath for a couple of years, to see whether her singing voice was good enough for her to perform as soloist in the Handel oratorios that William regularly promoted. This was most unlikely, for she was a German working-class girl, unused to society, and untrained in any form of music; but it was the only pretext they could invent.

**Fig. 1.3** Caroline as a young woman. Such ‘shades’ could be within reach even of poor families, and exact copies could be cheaply made, either at the time or later. Courtesy of the Museum of the History of Science, Oxford University



In August 1772 William went to Hanover in person to press the matter, and he shrewdly won Anna over by the promise of an annuity to pay for substitute help. Now that Anna was a widow, her eldest son Jacob was head of the household. Caroline, although a grown woman in her twenties, was reluctant to leave without Jacob's formal consent; but, by a happy chance, at the time of William's visit Jacob was away from Hanover with the Court Orchestra, of which he was a member. Letters took a long time to go to and fro, William had pressing