Anna Winlock

In 1875, Anna Winlock (1857-1904) approached the Harvard Observatory and asked if she might be employed in calculation. Winlock was the eldest daughter of Joseph Winlock, the director of the Harvard Observatory and the former superintendent of the Nautical Almanac. Joseph Winlock had unexpectedly succumbed to a brief illness, leaving behind a widow and five children with no obvious means of support. The officers of Harvard had been kind and gracious. They had given Mrs. Winlock a decent interval to vacate the house on the observatory grounds and had helped her to find a new home in Cambridge. Once they felt that the new widow was settled, they ceased all financial support of the family.

It fell to Anna Winlock, the eldest child at eighteen years of age, to sustain the family. Winlock had been close to her father in much the same way that Maria Mitchell had been close to William Mitchell. She had watched him work at the almanac office and learned from his example the rudiments of mathematical astronomy. When Anna Winlock was twelve years old, she had been her father's companion on an expedition to view an eclipse of the sun. The party left Cambridge and traveled southwest to Kentucky in order to make its camp. The young girl was probably included because the trip passed through the country of her father's birth. Along the way, the senior Winlock introduced his daughter to his various cousins and sisters and aunts. Nonetheless, the expedition was a time with the astronomers, an opportunity to prepare instruments and observe an eclipse.

Joseph Winlock had left the Harvard Observatory volumes of unreduced observations, a decade of numbers in a useless state. The interim director complained that he could not process the data, as "the condition of the funds is an objection to hiring anyone." At this point, Anna Winlock presented herself to the observatory and offered to reduce the observations. Harvard was able to offer her twenty-five cents an hour to do the computations. Winlock found the conditions acceptable and took the position. In less than a year, she was joined at the observatory by three other women. The first was Selina Bond, the daughter of her father's predecessor. Like Winlock, Bond stood in need of a steady income, as her father's fortune had been squandered through the actions of a "rascally trustee." The second, Rhoda Saunders, was the graduate of a local high school who had been recommended to the observatory by the Harvard president. The last was probably the relative of an assistant astronomer.

By 1880, the Harvard Observatory employed a complete staff of female computers. The director who hired this staff, Edward C. Pickering (1846-1919), is often considered progressive and liberal for employing women. He was called a "true Victorian gentleman in his attitude towards women and to everyone, men and women alike," by one of his computers. Pickering worked closely with a female benefactor, Mrs. Anna Palmer Draper, to finance the activities of the

observatory, and he encouraged an assistant to teach mathematical astronomy at Radcliffe College, the new women's school affiliated with Harvard.[48] Yet Pickering was motivated as much by economy as by altruism. "To attain the greatest efficiency," he wrote, "a skillful observer should never be obliged to spend time on what could be done equally well by an assistant at a much lower salary." The salary he offered to the women was half the prevailing rate for calculation. "[The Harvard] computers are largely women," complained the director of the Naval Observatory in Washington, "who can be got to work for next to nothing."

14. Computing room of the Harvard Observatory

"Pickering's Harem," as the group would occasionally be called, served as an uncomfortable example to the government computing agencies.[51] When the secretary of the navy asked why the Naval Observatory could not reduce its expenses for computation, as the Harvard Observatory had done, he was met with a defensive reply from the superintendent. He claimed that the Naval Observatory paid "its employees at exactly the same (or in some cases less) rate as in other branches of the Government Service," deftly deflecting the issue of hiring women. Shifting to a more aggressive position, he argued, "To charge extravagance against the Observatory because its employees are paid according to a rate fixed by law for the public service at large is clearly disingenuous and tending to mislead." The Naval Observatory would not hire a female computer until 1901. The Coast Survey and the Nautical Almanac, who had benefited from the labors of Maria Mitchell, were slightly more progressive and hired their second female computers in 1893. However, the Nautical Almanac was self-conscious about this action and identified its new employee as a man.

The Harvard Observatory has left an unusual document that suggests the daily routine of its computing staff and the challenges faced by the female computers. This document is a musical parody, entitled the *Observatory Pinafore*, based on W. S. Gilbert and Arthur Sullivan's operetta *H.* M. *S. Pinafore*. The parody was written by a junior astronomer, Winslow Upton (1853-1914), and so reflects the point of view of the astronomers, not the computers. It shows the women struggling with their work, confronting astronomers with problems, and working in an environment that would constrain their role or even deny that they were part of a scientific endeavor.

The *Observatory Pinafore* must be one of the first parodies of Gilbert and Sullivan's opera, a show that has been adapted and modified many times. Winslow Upton probably saw the original *H.* M. *S. Pinafore* during its American premier in November 1878. This production, unauthorized by Gilbert and Sullivan, debuted in the old Boston Museum of Art six months after the show opened in London. Upton acquired a copy of the vocal score and wrote his observatory version nine months later "during four rainy days of an August vacation in Vermont." He replaced the opening chorus of sailors, who tell of their shipboard life, with a chorus of computers, who sing:

We work from morn till night
For computing is our duty;
We're faithful and polite.
And our record book's a beauty;
With Crelle and Gauss, Chauvenet and Peirce, We labor hard all day;
We add, subtract, multiply and divide, And we never have time to play.

The song is in the same spirit as the original and suggests that Upton is going to follow Gilbert and Sullivan's original plot. In *H.* M. *S. Pinafore,* a young sailor is in love with the daughter of his captain. Prevented from marrying by the social gulf between them, the two spend much of the opera planning to elope. "Love levels all ranks," says one character, "but not so much as that." The show is filled with trios and dances, a silly song by a pompous bass singer, a touching lover's lament for the soprano, and a rousing chorus expressing English superiority. Near the end, one character announces, much to everyone's surprise, that the captain and the young sailor were switched at birth, an announcement that immediately elevates the sailor and allows him to wed his love. The other characters gleefully ignore the logical problems with this solution, notably that the young sailor is now old enough to be the father of his bride, and sing a rousing recap of the songs.