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Giving Women Astronomers Their Due

In their article "Gender and Science: Women in American Astronomy, 1859–1940" (March, page 58) John Lankford and Rickey L. Slavings discuss at length women's role as computers at the major observatories. Their description, while perhaps not pejorative, made it sound as if US astronomers were running sweatshops.

There is another view, namely, that their work as computers gave women an opportunity to pursue careers in science that would not otherwise have been available to them. I had the sad responsibility of preparing a memorial for Charlotte Moore Sitterly, who died recently at the age of 91. Sitterly produced monumental works on the solar spectral lines and on the spectra of the elements during her 70-year career at Princeton University, at the National Bureau of Standards and, in retirement, at the Naval Research Laboratory. She began her career as a computer at the observatory at Princeton in 1920, immediately upon obtaining her bachelor's degree from Swarthmore. By 1926 she was publishing. One of her first papers, for which she was the lead author, was written with Henry Norris Russell, who was to remain one of her principal collaborators. She did eventually earn a PhD, from the University of California, Berkeley, in 1931. Incidentally, she wrote at least one paper, in 1933, with Robert Grant Aitken of the Lick Observatory, who is cited in the article as having been "unable to recall anything of special importance about those women who passed through Lick."

I don't wish to excuse the appalling manner in which women have been treated by the professions—even in the 1950s, when I was a graduate student at Princeton, women were not being admitted there as undergraduate or graduate students—but it is not clear that Sitterly suffered scientifically for having started her career as a computer. It is not easy for an individual to pursue a science career starting on the wrong "track," which in Sitterly's case was with an undergraduate education and as a woman.

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4/90

There are numerous examples of the problems cited by John Lankford and Rickey Slavings with respect to women in astronomy. One with a slightly different twist—the woman was the donor of a prize—concerns the awarding of the Bruce Medal of the Astronomical Society of the Pacific. At the first meeting of that organization, on 30 March 1889, William Holden, its president and the director of the Lick Observatory, proposed that the society bestow a medal for notable astronomical research.[1] Through the offices of Edward C. Pickering, director of the Harvard College Observatory, Holden had already had contact with Catherine Wolfe Bruce of New York City, who, in what turned out to be the last decade of her life, had been making generous donations to astronomy, generally after seeking Pickering's advice. In due course Bruce endowed the award named after her, which has been presented to most of the major figures in astronomy in the past century.

Under the original terms of the award, the directors of three American and three foreign observatories were asked to nominate candidates. In 1901, three years after the initiation of the award, Pickering wrote: "I cannot do better than repeat my recommendation of last year that 'in view of the important part taken by women in American astronomy, and since the Bruce Medal was established by a woman, I recommend the woman who has made the most important astronomical discoveries, Mrs. W[illiamina] Fleming.' "

Four years later he elaborated: "Your letter asking me to nominate candidates for the Bruce Medal is received. I therefore make the following nominations:

"First, Mrs. W. P. Fleming for her discoveries and continuing researches in stellar spectroscopy, extending over the last twenty-four years. She has discovered nearly all of the novae, stars of the fifth light and stars having hydrogen less bright which have been found during the last twenty years."

Not only did Fleming never win the medal, but neither did her prominent successor Annie Jump Cannon. The list continues: Henrietta Leavitt, Cecilia Payne-Gaposchkin, Priscilla Bok, Emma T. R. Williams, Helen Sawyer Hogg. . . . Not until 1982 did a woman—E. Margaret Burbidge—win the Bruce Medal. Burbridge's is the only one of the 78 Bruce Medals awarded through 1985 to go to a woman. Maybe someone from the current crop of brilliant women astronomers will start a new trend. [*Note added in proof:* Such a trend may have been started with the awarding of the 1990 Bruce Medal this July to the late Charlotte Moore Sitterly.]

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4/90

BURBIDGE REPLIES: I am pleased to have the opportunity to comment on the letter by George Mumford, since I also read with great interest the article by John Lankford and Rickey Slavings on the sociological aspects of the professional lives of women in American astronomy in the period 1859–1940. The end of that period marked the beginning of my own professional life in astronomy, as a graduate student at the University of London. Mumford is correct in pointing out that there is a "crop of brilliant women astronomers" in the present generation. They are already winning some of the awards for younger astronomers and are being elected to important positions on the council and committees of the American Astronomical Society, as well as to the position of president and membership

on the board of directors of the Astronomical Society of the Pacific. The situation regarding tenured positions in university departments, however, still needs radical improvement.

Among the eminent women astronomers Mumford lists as obvious candidates who should have received the Bruce Medal, Cecilia Payne-Gaposchkin stands out as a particularly glaring omission. It is a pleasure to record that she did receive in 1976 the highest award of the American Astronomical Society, the Henry Norris Russell Lectureship, an honor bestowed for "a lifetime of eminence in astronomical research." She was the first woman to receive this honor since its institution in 1946.

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John Lankford and Rickey L. Slavings should be commended for their article. I have spoken extensively on the contributions of women to astronomy and space science and was very familiar with much of the material. What pleased me was the fine balanced analysis of the history of women in astronomy and the positive message the article projected.

Many authors dwell on the problems women have had in science, and in astronomy in particular. I do not feel that we will encourage young women to go into science if they hear mainly that. An article like "Gender and Science . . ." sends a message that we are aware of the problem and really want to do something about it. There should be more such articles in PHYSICS TODAY.

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LANKFORD REPLIES: The supporting evidence provided by George S. Mumford and the comments by Shirley W. Harrison add important elements to the discussion of gender in science. I am especially grateful to Harrison for her activities aimed at recruiting women into astronomy. If demographic projections are to be trusted, we need similar efforts in all the sciences.

Herbert Gursky's letter requires careful consideration. It is based on several misapprehensions. Historians do not see the accurate reporting of data as "pejorative." Telling it like it really was involves looking at the past, warts and all. Frequently, the only interest scientists have in history is when it serves to glorify contemporary ideas, individuals or institutions. This is not how historians understand their task.

If "sweatshop" (Gursky's phrase) is defined as a place in which workers spend long hours for low pay with virtually no chance for advancement, then the great factory observatories approximated those conditions. To be sure, they were physically more comfortable and safer than the typical garment factory, in which women toiled for 12 or more hours a day.

Let Harvard's Williamina Paton Fleming explain the situation to Gursky. Writing in her diary in March 1900, Fleming reported a conversation with observatory director Edward C. Pickering.[1] "He seems to think that no work is too much or too hard for me, no matter what the responsibility or how long the hours," she wrote. But when Fleming raised the question of salary, Pickering refused to discuss the matter. She was "immediately told that I receive an excellent salary as women's salaries stand." Fleming earned $1500 a year. Apparently, males occupying the same rank (but with the chance to move up) earned $2500. Fleming went on, "The Director expects me to work from 9 am to 6 pm, although my time called for is 7 hours a day, and I feel almost on the verge of breaking down." She acknowledged that there was always a great deal of work to do at the Harvard College Observatory but asked, "Why throw so much of it on me, and pay me in such small proportion to the others?"

The Harvard College Observatory was a genteel and respectable sweatshop, but the name of the game was exploitation, whatever the trappings.

A second point deserves attention. While Gursky offers the career of Charlotte Moore Sitterly as a counterexample, he misses key issues. Moore Sitterly never achieved a tenured position at an observatory or a research university. Nor did she receive the honors and recognition a man with her ability and publication record would have expected. She may have been able to do science, but only at a great price.

If, as Gursky suggests, beginning at the rank of computer "gave women an opportunity to pursue careers in science that would not otherwise have been available to them," then, in the end, that same circumstance must have turned most women away from science. Data from our collective biography throw light on the length of careers in astronomy. Of the 426 women active in American astronomy between 1859 and 1940, fully 50% had careers that lasted between 1 and 5 years. At the end of 9 years, 60% of the original sample were gone. This stands in sharp contrast to the experience of the elite (astronomers elected to the National Academy of Sciences or starred in *American Men of Science*). After 20 years, only 10% of these astronomers had left the field, and fully half were still active after almost 40 years. Given these differing experiences, it is difficult to believe that women, most of whom started as computers, felt they had a chance for a real career.

Historian Peggy Aldrich Kidwell cites further contemporary evidence on this point[2]: Astronomer Caroline Furness, of Vassar, doubted that women who began as computers had much chance for a satisfying career. Male observatory directors, she wrote, would never give a woman "a position of prominence where she can use her own initiative. She is only a hack worker."

Through a careless error, I supplied incorrect attributions for several of the photographs included in our article. I would like to use this opportunity to give the proper credits:

▷ Page 60, photo of Cecilia Payne-Gaposchkin and Annie Jump Cannon: reprinted from *Sky and Telescope*, courtesy of Owen Gingerich, Harvard–Smithsonian Center for Astrophysics

▷ Page 61, photo of Fleming and Mable Stevens: Harvard College Observatory, courtesy of Gingerich and Barbara Welther, Harvard–Smithsonian Center for Astrophysics

▷ Page 62, photo of Anna Palmer Draper and members of the Harvard Observatory computing staff: Harvard College Observatory, courtesy of Welther

▷ Page 63, photo of Maria Mitchell, and page 65, photo of Furness: Vassar College archives, courtesy of Henry Albers, Vassar College.

I am indebted to Welther for bringing these pictures, including some in her own research collection, to my attention, and I apologize for sending them for publication before consulting her.

Special thanks go to Nancy S. MacKechnie, curator of rare books and manuscripts at the Vassar College Library, and to Albers for their gracious permission (after the fact) to publish the pictures of Mitchell and Furness.

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