ANNE CALLAHAN
WRITING SAMPLE

APPLICATION TO UNIVERSITY OF DELAWARE, AMERICAN CIVILIZATION PROGRAM

More Than Historical Evidence: Re-reading the Journal of Williamina Paton Fleming

"I am the loadstone left to prevent the house from blowing away," wrote Williamina Paton Fleming on March 2, 1900, describing a household emptied of its other inhabitants, her teenaged son Edward, his visiting friend Nyle, and Fleming's co-worker and boarder Annie Cannon. Fleming spent the evening at home recording the day's activities in a document she titled, in her precise cursive handwriting, "Journal of Williamina Paton Fleming. Curator of Astronomical Photographs. Harvard College Observatory." Forty-two years old in March, 1900, Fleming had been promoted to the newly-created position Curator of Astronomical Photographs in 1898 after working at the Harvard College Observatory for eighteen years, first in domestic service, then as a copyist and computer, and finally as supervisor of a team of computers. With her new appointment, Fleming became the first and, during her lifetime, the only woman to hold a title recognized by the Harvard Corporation, a distinction that goes unmentioned in her journal or elsewhere in her writings.[1]

The Journal of Williamina Paton Fleming is a twenty-two page manuscript with entries accounting for each day in March, 1900. It is, in a sense, a commissioned work, created by Fleming in response to a call for documentation of university life at Harvard at the turn of the century. In a letter circulated to faculty, staff, and students, Harvard University librarian William Lane advertised the documentation project as a "time capsule … for the benefit of our successors at the close of the twentieth century." Lane proposed a format for contributions, instructing each participant to "keep a careful journal of his daily doings, recording faithfully, and in as much details as he can, all that goes on from day to day," and encouraged contributors to imagine "writing without reserve to some friend at a distance."[2] Contributions from students, faculty, and staff were deposited in a locked box to be opened no earlier than 1960. Fleming's Journal was not a private act of reflection, but rather a public record intended for us: future readers looking backwards. Fleming's detailed descriptions of daily work, household arrangements, and social plans; her dissatisfaction with her wages and frustrations with subordinates; and her carefully-worded disclaimers all constitute a story she wished to convey to readers at a distance of sixty years or more.

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[1] Fleming's name and title appeared in the 1899-1900 Harvard University Catalogue. Dr. Alice Hamilton became the second woman whose name and title appeared in the Harvard Catalogue when she was appointed Assistant Professor of Industrial Medicine at the Harvard Medical School in 1919. Fleming's writings, in addition to the Journal, include drafts of correspondence in the Papers of Williamina Paton Fleming held at the Harvard University Archives, articles and remarks in *The Harvard College Observatory Annals* and *Circulars*, and two magazine articles about women's work in astronomy.

[2] See memorandum from William Lane in the "Chest of 1900" Collection, Harvard University Archives (HUA 1900.12). The documentation project was originally proposed by Harvard geology professor William Morris Davis as project for faculty.

In this essay, I take seriously William Lane's lofty phrase, "for the benefit of our successors." As Fleming's successors, what do we gain by reading her day-by-day account of March, 1900? Historian of science Margaret Rossiter's book *Women Scientists in America: Struggles and Strategies to 1940*, published in 1983, is the first historical study to use Fleming's Journal as a source.[3] Rossiter described the Journal as a "private diary about her job" created "as part of a university-wide historical project" and notes that the Journal was "recently uncovered in the Harvard University Archives."[4] Since the 1980s, Fleming's Journal has interested numerous scholars and general interest writers turning their attention to women's contributions to scientific research. Academic articles and magazine essays cite Fleming's words as evidence of computers' day-to-day work, of typical wages for a professional woman at the turn of the century, of relationships and hierarchies within the Harvard College Observatory, and of Fleming's pragmatism and work ethic.[5] Of the 72 contributions made to the "Chest of 1900" and preserved in the Harvard University Archives, the Journal of Williamina Paton Fleming is the only text that has been digitized and made publicly accessible via the Harvard Library catalog.[6]

The Journal's popularity as a source has the paradoxical effect of rendering it both visible and invisible, of amplifying noteworthy passages while obscuring the whole. In this essay, I attempt to shed a light on the Journal by spending more time with it in its entirety, probing details and ambiguities, in order to gain a more expansive view of the text. Instead of using the Journal as a source to buttress a claim, I will read the Journal as itself a set of claims, however incomplete or inconsistent. Approaching the Journal on its own terms opens up two modes of interpretation: (1) the Journal as a constructed narrative, the style and structure of which reflect the priorities of its author, and (2) the Journal as an artifact of early twentieth-century North American offering evidence of interconnected conditions of gender, race, class, geography, economy, and politics as they played out in lived experience. In one mode, Fleming is an author whose rhetorical decisions warrant interpretation, in the other, she is a record-keeper, a representative of her time and place, whose experiences add to our understanding of known social patterns. Reading the Journal in both modes allows readers to focus their attention on narratives emphasized by Fleming, such as her conflict with the Observatory Director over her wages (see "an enlightened age!" on page X) as well as events recorded seemingly incidentally and fragmentarily, such as the transfer of domestic work from Fleming to Mary, an Irish maid, and, when Mary became ill, from Mary to an unnamed temporary worker, a series of economic transactions that reflect both personal realities and social patterns (see "Mary" on page X).

The essay is organized into sections each keyed to a word or phrase quoted from the Journal, or, in two cases, from Harvard librarian William Lane's memorandum. These quotations appear as section titles and provide the basis for the investigation that makes up the section. The Journal of Williamina Paton Fleming appears here in its entirety, images of its pages interleaved between the pages of this essay. In most cases, the quotation that forms the section title appears in the Journal on a

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[3] Margaret Rossiter, *Women Scientists in America: Struggles and Strategies to 1940* (Johns Hopkins University Press, 1982).

[4] Ibid., 56.

[5] [List citations for academic and popular references to the diary]

[6] Harvard University Archives, Chest of 1900, Diaries, Journal of Williamina Paton Fleming (HUA 900.11) <https://iiif.lib.harvard.edu/manifests/view/drs:3007384$1i>. Accessed 17 December 2021.

nearby page. This structure allows room for wide-ranging explorations of meanings (historical and rhetorical) while staying close to the (material) text.

"such excellent opportunities for work"

Fleming's contemporaries would have recognized in her contribution to the "Chest of 1900" an account of cutting-edge research at a leading scientific institution, and the novelty of her role in it. The Astronomical Photographic Plate Collection at the Harvard College Observatory was the material result of an ambitious project initiated by Observatory Director Edward Pickering to create a photographic survey of the sky.[7] Photography was a novel technology in 1900, and astronomical photography was an emerging, though increasingly accepted, technique for scientific observation.[8] The Observatory rapidly perfected the practice of astrophotography under the direction of Pickering, who secured funding from wealthy donors to build new instruments and hire staff to create and examine the photographs.[9] The first photographic image of a star, a daguerreotype of Vega, was created at the Harvard Observatory in 1850; by 1900, the Observatory's Collection of Astronomical Photographs numbered about 200,000, a new brick building had been constructed to securely house the collection, and a corps of women computers had been hired to take measurements from the photographs, in order to convert images of stars into tabular data that would be printed in Observatory publications and distributed internationally.

Many aspects of the Harvard College Observatory's late nineteenth- and early twentieth-century astrophotography program are remarkable, but the corps of women computers who measured the photographs in particular have captured twenty-first century attention. In the chronology of women's rights with which twenty-first century Americans are most familiar — suffrage in 1920 and opportunities to enter the workforce during the First World War, Women's Lib in the 1960s followed by new professional opportunities by the turn of the century — a department of white women working as scientists in the 1880s may appear as an anachronism. In fact, women's employment in scientific institutions made late nineteenth-century sense. Educational opportunities for white women in the U.S. had expanded enormously with the establishment of women's colleges, including the Harvard Annex, where male Harvard faculty taught female students starting in 1877 (the Harvard Annex was incorporated as Radcliffe College in 1894), and the women's colleges [Wellesley and Vassar]. The precedent for single women working for wages outside the home had been established in the New England textile industries starting in the 1830s, and was extended with the white, middle-class

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[7] Bessie Zaban Jones and Lyle Gifford Boyd, *The Harvard College Observatory* (Cambridge: Harvard University Press, 1971), 198.

[8] Keith LaFortune, "Women at the Harvard College Observatory, 1877-1919: 'Women's Work,' The 'New' Sociality of Astronomy, and Scientific Labor," (Master's Thesis, 2001), 75.

[9] In the 1890s Edward Pickering directed the establishment of a Harvard observing station in Arequipa, Peru, in order to capture images from the perspective of the Southern Hemisphere. That project deserves historical treatment on its own as a scientific and colonial project.

feminization of clerical work that started during the Civil War years and increased toward the end of the century.[10]

In his Master's thesis about labor practices and management theory at the Harvard Observatory, Keith LaFortune shows that the rise of "big science" at the end the nineteenth century introduced new hierarchal structures in scientific institutions. Abundant low-level workers were needed to process new data — repetitive and detail-oriented work perceived as well-suited for women — while high-level administrative and research jobs remained open only to men.[11] Historian Margaret W. Rossiter provides the examples of the Bureau of Plant Industry, part of the United Stated Food and Drug Administration, and academic faculties in the emerging disciplines of nutrition and home economics as places where women were hired as assistants engaged in science starting in the 1880s and 1890s.[12]

At the Observatory, Director Edward Pickering's personal advocacy for women in science together with his high value on thrift set up the conditions in which up to twenty-six women at a time were employed in measuring and classifying stars and reducing data from astronomical photographs.[13] In his previous position as a physics professor at the Massachusetts Institute of Technology, Pickering bypassed the Institute's gender segregation policy by allowing professor Sarah Frances Whiting to observe his classes and use his materials as the basis for physics classes she to taught at Wellesley, a women's college near Boston.[14] In an address to the American Association for the Advancement of Science in 1913 about the urgent need for more funding for astronomical research, Pickering went so far as to remark on the unfortunate scarcity of funding available to women for original scientific research.[15] Pickering's personal confidence in women's abilities as scientists did not prevent him from taking advantage of the wage labor structure in which their work was devalued. Perpetually trying to accomplish ambitious projects on small budgets, Pickering was preoccupied throughout his career with his idea of the "astronomical bargain": any project that required a minimum of capital to produce large returns in terms of additions to scientific knowledge.[16] By those terms, the corps of computers at the Observatory was a exemplary astronomical bargain. Not only were female computers' wages lower than those of male computers (typically 25c per hour compared to a prevailing rate of 50c per hour for

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[10] The nineteenth century feminization of clerical work is described in Carole Srole, "'A position that God has not particularly assigned to men': the feminization of clerical work, Boston 1860-1915" (PhD dissertation, 1984); Debra Gold Hansen, *Strained Sisterhood: Gender and Class in the Boston Female Anti-slavery Society* (Amherst, MA: University of Massachusetts Press, 1993), 52; and,Sharon Hartman Strom, "'Light Manufacturing': The Feminization of American Office Work, 1900-1930" in *Industrial and Labor Relations Review* vol. 43 no. 1 (Ithaca, N.Y. 1989), 55.

[11] LaFortune 34.

[12] Margaret W. Rossiter, "'Women's Work' in Science, 1880-1910," *Isis* vol. 71 no. 3 (Sep. 1980) 381-398.

[13] LaFortune, "HCO Payroll, 1877-1919" 168-190. Twenty-six is the largest number of women employed as computers at the Observatory at one time during Edward Pickering's tenure as director. The mean number of women employed at once is 19.

[14] Plotkin, "Edward Charles Pickering," *Dictionary of Scientific Biography*, vol. 10, ed. Charles Gillispie (New York: Charles Scribner's Sons, 1976), 599.

[15] Edward Pickering, "The Study of the Stars," *Science*, New Series, 39 (1914), 2. This sentiment expressed in a venue away from Harvard, seemingly so at odds with the hierarchical "scientifically managed" workplace he created at the Harvard Observatory, suggests that Pickering recognized the problems with the structure he had created but counted it as a worthwhile sacrifice as long as resources were limited.

[16] Pickering, "The Future of Astronomy," *Popular Science Monthly 75* (1909), 109.

computing work)[17], women with few other opportunities for scientific or professional work proved to more efficient and more accurate than men when handling repetitive work.[18] Furthermore, Pickering and Fleming had an oversupply of qualified candidates to choose from among the graduates of women's colleges like Wellesley and Vassar, many of whom had completed astronomy courses.[19] Furthermore, the prestige of association with the Observatory and the University may have been its own brand of compensation for many of the women Pickering and Fleming hired.[20]

Early in the Journal, Fleming expressed unreserved satisfaction with her own employment at the Observatory, extolling both the nature of the work and her connection to the Director: "I am more than contented to have such excellent opportunities for work in so many directions, and proud to be considered of any assistance to such a thoroughly capable Scientific man as our Director." Fleming's 'more than contentment' immediately followed a bitter complaint, however:

> If one could only go on and on with original work, looking for new stars, variables, classifying spectra and studying their peculiarities and changes, life would be a most beautiful dream; but you come down to its realities when you have to put all that is most interesting to you aside, in order to use most of your available time preparing the work of others for publication.

In fact, alternating expressions of frustration and satisfaction with her employment such as these form the Journal's refrain. That Fleming wrote the Journal at all attests to her pride in her work and her confidence in its lasting value. The opportunity to do "original work," though limited, seemed to be an important source of the job's appeal. This "original work" earned Fleming a reputation in the popular press, as a discoverer of new stars, and among colleagues from other institutions (Fleming was made an honorary member of Royal Astronomical Society in 1909, for example). To be "proud to be of assistance" to Pickering suggests that her identity depended to some extent on her association with him. But strength of her identification with the Observatory and with her research barely mitigates her frustration with long hours, unending work, and unfair compensation. Indeed, Fleming ends the Journal ends not on a note of contentment but with a provocation: "I am told that my services are very valuable to the Observatory, but when I compare the compensation with that received by women elsewhere, I feel that my work cannot be of much account."

Fleming's protest is reminiscent of, though entirely removed from, the tradition of organized labor. But Fleming would neither disappoint her employer nor cultivate solidarity with her assistants in the Astrophotographic Building. Her refrain of suffering alternating with appreciation speaks to the tension between injustice and privilege experienced by a white middle-class woman who may have seen herself as having worked her way up in the economic and social systems against the odds.

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[17] David Alan Grier, *When Computers Were Human* (Princeton UP, 2015), 83.

[18] Rossiter, 383.

[19] Jones and Boyd 388-389; LaFortune 81.

[20] Harvard University astronomer Cecilia Payne-Gaposchkin writes in her 1979 memoir that a job as a computer "was respectable work at the end of the nineteenth century, work that conferred a certain distinction, and the old Director had taken full advantage of the fact." Cecilia Payne-Gaposchkin, *An Autobiography and Other Recollections*, ed. Katherine Haramundanis (New York, N.Y.: Cambridge University Press, 1984), 137.

"the care of the photographs"

Fleming beings her Journal on March 1, 1900, by listing her and her assistants' professional duties:

> In the Astrophotographic building of the Observatory 12 women, including myself, are engaged in the care of the photographs; identification, examination and measurement of them; reduction of these measurements, and preparation of results for the printer.

Fleming's use of the word "care" to describe her primary duty at work warrants attention because it points toward a source of tension: Fleming is a woman in a high-status position in a conventionally male domain, while care was (and is) a gendered activity connected to informal women's work in the home. Sociologist Hilary Graham, writing about care work in 1983, defined care as invisible labor that creates well-being in other people, and characterized it as ongoing, always needed, and unfinishable.[21] Graham's framework is useful here because the ways it does and does not apply to Fleming's work show how she moved between visibility and invisibility, dissatisfaction and satisfaction, and male and female roles.

Fleming's work as the caretaker of a research collection in a scientific institution is different in important ways from the care of a person or household, the subject of Graham's study. Caring for astronomical photographs was a professional and managerial role in which Fleming earned a national reputation and a middle-class salary, while caring for persons and households was, and remains, low-status and low-paying labor removed from the public sphere. But while the practical significance of the difference between these types of care work cannot be overstated, the model of care as labor that creates well-being in others can still be usefully applied to Fleming's work by asking, who did her work benefit?

The primary beneficiary of Fleming's labor was Observatory Director Edward Pickering, who hired and promoted Fleming and directly supervised her work. Fleming's care of the photographs and her efficient management of the work ("identification, examination and measurement") that made the photographs useful, culminated in the publication of several much-anticipated star catalogs. The initial publication of results from Harvard's new astrophotography program was *The Draper Catalog of Stellar Spectra* in 1890, which compiled location data, brightness measurements, spectral classifications, and standard names for an astonishing 10,351 stars. Pickering correctly anticipated that Harvard's star catalogs would establish the Observatory's reputation as a model astrophotography program and an international clearinghouse for astronomical data. Fleming's labor thus directly benefited Pickering, whose ambitious plans were realized. And from Pickering's perspective (surely shared by Fleming), the realization of his plans in turn benefited the Observatory, the University, and the field of astronomy as a whole. Pickering by all accounts considered the advancement of human knowledge to be the primary intention for his work. He offered astronomers from other institutions full access to astronomical photographs not in use (Fleming or an assistant would pack and ship the plates), he

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[21] Graham, Hilary, "Caring: a labour of love" in Janet Finch and Dulcie Groves, eds., *A Labour of Love. Women, Work and Caring* (London: Routledge, 1983) 13-30.

offered look-up services for researchers seeking confirmation of astronomical data (Fleming would locate the needed photograph and provide the data in question) and he freely advised other observatories on technical questions about instrumentation or photographic techniques.[22] In a more extreme example of his astronomy-first mindset, in 1909 Pickering outlined a utopian scheme to consolidate international astronomical research in two centralized locations in the Northern and Southern hemispheres, with facilities and staff funded by pooled resources and where research would be freely exchanged.[23] Fleming must have viewed working for Pickering as working for a cause much larger than himself.

The value of Fleming's work to Pickering's institutional and intellectual vision is apparent in the condolence letters Pickering received following her death in 1911. That Pickering, her employer, received so many condolence letters is itself notable, and bears out the kinship inflection of Fleming's and Pickering's relationship. One sender wrote that he would have sent his letter of condolence to Fleming's son if had his address; not having it, he wrote to Pickering. Furthermore, the letter-writers characterize Fleming's death as a great loss to Pickering, to the observatory, and in some cases to the field of astronomy as a whole. "Her death is great loss to science of astronomy," E. E. Barnard from Yerkes Observatory in Wisconsin wrote to Pickering. A colleague in Pasadena wrote:

> We were shocked and distressed to hear a few days ago of the loss that the Harvard Observatory, and you personally, have suffered in the death of Mrs. Fleming — I know of course of the value of her scientific work, and I also know something of the way in which she was able to relieve you of a large burden of the routine administrative work of the Observatory…[24]

Graham began her definition of care as invisible work performed by women. As Curator of the Astronomical Photographs Fleming was certainly visible, well-known in the field of astronomy and often featured in the national press as a celebrated discoverer of new stars (her identity as a woman even increased her visibility in this context). Yet a complete picture of her labor was *not* visible, and, by her account, not fully valued. Consciously or not, she used the Journal to make it visible, reporting on the hours spent each day in routine work: delegating, supervising, checking assistants' work, and, most often, editing manuscripts for publication. She compares this routine work to the "original work" she relishes:

> If one could only go on and on with original work, looking for new stars, variables, classifying spectra and studying their peculiarities and changes, life would be a most beautiful dream, but you come down to its realities when you have to put all that is most interesting to you aside, in order to use most of your available time preparing the work of others for publication.

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[22] LaFortune 87.

[23] Edward C. Pickering, "The Future of Astronomy," *Popular Science Monthly* 75 (1909), 115.

[24] The Papers of Williamina Paton Fleming (HUG 1396.5), Harvard University Archives.

The dichotomy between interesting and tedious work corresponds to the dichotomy of visible and invisible labor: newspaper headlines and professional distinctions honored Fleming's discoveries of new stars and her original spectral classification system, even while the majority of her time was spent "preparing the work of others." Fleming's (and other women's) editing labor at the Observatory could be a rewarding subject of close study and interpretation through the lens of the care work.

"Mary"

Mary, thirty or thirty-one years old in 1900, was a single woman and immigrant to the U.S. from Ireland who worked for Williamina Fleming in her home. She first appears in Fleming's Journal only to disappear: "Miss Cannon and Edward had already started cooking operations, this being my maid's 'afternoon out'," Fleming wrote on Wednesday, March 7. Fleming, her son Edward, and Cannon take Mary's place in the washing up: "Then we had a siege clearing up dishes, washing kettles, and putting all away." After her initial (dis)appearance, Mary shows up three more times in the Journal. She set out dinner for Fleming and her household on Thursday, March 8 ("On reaching home it seemed good to find Mary in the kitchen and dinner ready to be placed on the table"), she fell sick alongside Fleming and her son on March 21 ("By the time Dr. Bailey arrived we had a third patient for him"), and she partially recovered on March 26 ("Mary was able to get up and be taken home").

In contrast to Fleming as Curator-Caretaker, Mary is a caretaker who cares for the physical needs of people, and whose work is low-status, poorly-compensated, and privately performed. Fleming enables Pickering's research agenda, Mary enables Fleming's professional career. Together, Fleming and Mary represent an economic system in which high-status work outside the home is both made possible *by*, and provides means to pay *for*, low-status work inside the home. This relationship is made more complex by knowledge of Fleming's trajectory as a working woman in the U.S. after her immigration from Scotland: her move from the position of maid in Pickering's house (the east wing of the main Observatory building), to copyist and computer (in the west wing of the Observatory building), to Curator and supervisor. Fleming traded domestic care work for scientific care work when the opportunity arose, in a much mythologized interaction, or set of interactions, between Fleming, Pickering, and probably Pickering's wife Lizzie Pickering.[25]

Occupied with this higher-status and higher-paying work, Fleming herself became a consumer and beneficiary of care work, transferring part of the household labor to Mary. Notably, Fleming was a different type of consumer of care work from Edward and Lizzie. In the Pickering household, Fleming served as a second maid (by one account, a cook), while in her own household Fleming shares domestic work with Mary, washing linens herself presumably because she could not afford the extra

[25] The mythology is around the discovery, while Fleming was working as a maid, of her intelligence and education by her employers. Fleming, born in a middle-class family in Dundee, Scotland, had been educated in the public schools and worked as a teacher until she married and immigrated to the U.S. in 1878. At or around the time Fleming became a maid in the Pickering household, she was pregnant and her husband James Fleming was absent. Edward Pickering supported her trip back to Scotland to give birth, who was named Edward Pickering Fleming. Fleming returned to the Observatory to take up a position as a computer in 1881. See Judy Barrett Litoff, *European Immigrant Women in the United States: A Biographical Dictionary* (Taylor & Francis, 1994), 93.

expense of washing.[26] In both households, domestic labor occupied more than one person, but it was distributed differently depending on wealth.

Fleming's status as a consumer and beneficiary of Mary's care work points to another notable dimension of Fleming's role in her household: she is the head of it. In federal census schedules for 1900 and 1910, Fleming is listed as "head of household" and "widow." Fleming's husband was absent starting in 1879, two years after their marriage in Scotland. His desertion or death had the twin effects of leaving Fleming in financial straits while expecting a child and making it possible for her to have a professional career outside her home, an option that was hardly available to married women. As head of household after her husband's exit, Fleming not only supervised Mary, playing a management role relished by some middle-class women, she also paid Mary from her own earnings. Fleming was husband (head of household) as well as wife (household manager). She laid out this paradox in the first paragraph of the Journal: "My home life is necessarily different from that of other officers of the University since all housekeeping cares rest on me, in addition to those of providing the means to meet their expenses." Fleming might also have observed, How different my home life is from other middle class women.

It is possible to find an outline of Mary's work life using her four appearances in the Journal and Fleming's comments about her own household responsibilities, where Mary's absence indicates that certain tasks were not her responsibility. Mary cooked, served, and washed up after meals for members of Fleming's household and may have cleaned other parts of the house as well. Her work in the kitchen would have included keeping a fire going for part of day. She did not shop for food or household supplies (Fleming wrote about procuring food and supplies twice in the Journal) and she did not do laundry (Fleming describes collecting the household wash on a Sunday, her day off from the Observatory). When Mary fell sick at work, Fleming apparently provided healthcare, calling in a doctor to see three patients at once, Fleming, Edward, and Mary, and hired a temporary worker to cook for all of them.

The 1900 U.S. census schedule for Cambridge, Massachusetts provides additional brief data about Mary. She is listed on the census schedule as Marie Hegarty, servant, a member of the household on Upland Road of which Williamina Fleming is head. Marie Hegarty is thirty-five and unmarried, was born in Ireland and immigrated to the U.S. in 1893 at age twenty-eight. She can read, write, and speak English. She spent "0" years in school. Her birthday is in July. Mary(Marie) is not listed as a member of Fleming's household ten years later in the 1910 census.

The census schedules for 1900 tell us that on Upland Road and the neighboring streets, ten other single women worked as servants, seven of whom were born in Ireland. Social and immigration histories of Boston have shown that Irish women dominated domestic service jobs in the city for most of the nineteenth century.[27] Mary and other women arriving in Massachusetts from Ireland and looking for work chose between domestic service and work in the mills or needle trades, the two professions in which the overwhelming majority of women in Boston worked.[28] Perhaps Mary chose to take a

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[26] Washerwomen represented a separate profession from maids in nineteenth-century Boston and often worked from their own homes. Maids who washed laundry in addition to other household work, would have expected extra pay. Dublin 62; Katzman 85-86; and Anon., "The Experiences of a Hired Girl," *Outlook* (Apr. 6, 1912).

[27] David Katzman, *Seven Days a Week* (New York: Oxford University Press, 1978), 66.

[28] Dublin, 236.

position as maid because because she appreciated the flexibility of her schedule compared to the strict schedule of work in the mills, or she because she preferred the financial arrangement in which her employee provided room and board.

Two statements in the Journal placed Mary outside her workplace in Fleming's home. After she partially recovered from an illness on March 26, Mary was "taken home," suggesting that she had family living within carriage distance who were able and willing to care for her in poor health. Thus we can imagine Mary taking part in a household economy separate and different from Fleming's, in which she may be a sister or niece or cousin. Perhaps she contributed to this kinship economy with her cash or labor, and was supported by others in turn. The second situation that places Mary outside Fleming's home is her 'afternoon out' on March 7. Fleming's use of quotation marks around words and phrases throughout the Journal suggest that she is a borrowing a word or term with cultural meaning beyond plain description, and Mary's "afternoon out" fits into this usage pattern. Universalizing descriptions of domestic servants, including censuring of their off-duty activities, filled late nineteenth-century magazines and newspapers aimed at middle- and upper-class native-born women readers.[29] "The Irish declaration of independence has been read in our kitchens ... to frighten housewives," wrote the editorial columnist in *Puck* magazine in 1883, "The fruits of that declaration are to be seen in … ill-cooked meals on ill-served tables, in unswept rooms and unmade beds, in dirt, confusion, insubordination, and general life."[30] Mary's "afternoon out" can be read as more than an afternoon out; from Fleming's perspective, it may have represented an element of negotiated control over working conditions; a desire for a break from work (something Fleming eschewed in her own job); and simply an afternoon of extra (domestic) work for Fleming who, by her own account, felt perpetually overworked.

Mary's "afternoon out" is also significant as a formal element in the Journal, as a symbolic opening, literally a period of liberation from a low-status job. It is also a metaphor, a site of escape, indeterminacy, and potentiality for twenty-first century readers reading across and through Fleming's text for Mary's personhood.

"an enlightened age!"

Fleming's account of her salary negotiation with Edward Pickering on March 12 reads like a didactic dramatization of a white woman's experience in the white-collar workplace at the turn of the nineteenth century. "Sometimes I feel tempted to give up and let him try someone else, or some of the men to do my work," Fleming wrote, after recounting a discussion with Pickering in which he stated that she received an "excellent salary as women's salaries stand." "Does he ever think that I have a home to keep and a family to take care of as well as the men?" she continues. The passage reads like a demonstration piece partly because it picks up on so many of the issues at stake for historians of labor and women's rights in the U.S., partly because the failure of the negotiation is such a satisfying

[29] Faye E. Dudden, *Serving Women* (Wesleyan University Press, 1983), 65-71.

[30] *Puck*, May 9, 1883.

example of sexism, and partly because such a direct and peaceful negotiation between a male employer and female employee in 1900 seems like the product of wishful thinking.

Fleming's fundamental trust in her employer shows through in her conviction that, presented with sufficient evidence, he would see the truth of her case. If she were to "give up", or were a man to be substituted in her place, Pickering would "find out what he is getting," that is to say, he would recognize her true value (at least 2,500 dollars per month, by her accounting). Fleming expresses her confidence in Pickering most clearly in the postscript at the end the Journal, dated April 18, in which she qualifies her earlier complaints about her salary:

> I find that on March 12 I had written at considerable length regarding my salary. I do not intend this to reflect on the Director's judgment, but feel that it is due to his lack of knowledge regarding the salaries received by women in responsible positions elsewhere.

Writing to a future reader, she exonerated Pickering while maintaining the injustice of the system. Notably, she also removed men from the comparison. On March 12 Fleming declared that men employed at the Observatory could not do her job effectively and, separately, that her work was of equal (cash) value to theirs. On April 18, she compared her salary only to the salaries of other women "in responsible positions."

Fleming's rhetorical threat to "give up" evokes the logic of the workers' strike, a tactic of organized labor unions widely practiced in factories, and reported on in local press, throughout eastern Massachusetts in the second half of the nineteenth century. As early as the 1834, 30 miles north of Cambridge in Lowell, Massachusetts, women working in textile mills organized "turn-outs" to protest wage reductions, rent increases in factory housing, long work days, and onerous workplace regulations. Early in the twentieth century, the largest protest by working women to date occurred in New York City, when tens of thousands of women employed in shirtwaist factories, most of them immigrants, struck for three months between November 1909 and February 1910, demanding higher wages, shorter working hours, better working conditions, and the right to union representation. The women who organized and participated in the Shirtwaist Strike were, like Fleming, immigrants to the U.S. seeking to improve their economic prospects. But their demands — for opportunities to earn more than four dollars per week (by way of promotions to conventionally male positions) and a reduction from the 14-hour workday — illustrate the gap between their working lives in the textile trade and Fleming's at the Observatory. We know from the Journal that in 1900 Fleming worked seven or eight hours per day and earned a salary of approximately 30 dollars per week. We learn too that her schedule was flexible within certain constraints (she made shopping trips into Boston during the workday, for example), that she was treated as a colleague by (male) scientists at the Observatory and elsewhere, and that she genuinely loved aspects of her work.[31] Finally, she was a manager who supervised the work of a corps of assistants and worked closely with her own manager. From this position, Fleming saw the same injustices decried by the Shirtwaist Strikers but weighed them against the security, status, and intellectual satisfaction conferred by her position.

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31 When Fleming requested the Director's permission to take care of household affairs in Boston, he suggested a change to her schedule ("a more economical arrangement of time") but approved of her leaving. Later, during her illness in the last two weeks of March, Fleming states that she was absent from work for three days and expresses no anxiety about repercussions, only eagerness to return to her work.

Fleming directly compares herself with men three times in the Journal: she states that her life is necessarily different from that of the other Officers of the University; she desires to place "some of the men" (Observatory staff members) in her professional position in order to prove her worth to Pickering; and she questions whether Pickering recognizes her simultaneous roles as working woman and head of household who deserves a "male" wage:

> Does he ever think that I have a home to keep and a family to take care of as well as the men? But I suppose a woman has no claim to such comforts. And this is considered an enlightened age! I cannot make my salary meet my present expenses with Edward in the Institute, and still another year there ahead of him.

Her question, and the following statement of resignation, precisely illustrate the paradox in the calculation of women's wages in the turn-of-the-century U.S. Indeed, the notion that a woman has "no claim to such comforts" — such comforts as a middle-class household and her child's upward mobility through college education — bears out in late nineteenth-century guides for business owners as well as feminist debates. Women's wages did not reflect a market price for work completed, but rather an amount appropriate to women's limited personal needs as members of family economy led by a male breadwinner. Her wage was a moral rather than a market matter. It was *appropriate* to acknowledge that working women did not depend on their own wages, but rather on the"family wage" earned by male kin.[32] Fleming's question, while resisting the reality of women's wages, also points to a paradox in her relationship with Pickering. Fleming's father died when she was a child and her husband is dead or absent. By providing her with opportunities for professional work and advancement, Pickering simultaneously invites Fleming into an economic and paternal relationship with him, recognizes her *in*dependent status, and calculates her salary according to the conventional assumption that she is dependent.

At the end of the passage, Fleming condemns an apparent breach of contract—a requirement to work longer hours than formally agreed upon—and acknowledges the toll of overwork on her body:

> The Director expects me to work from 9 AM until 6 PM., although my time called for is 7 hours a day, and I feel almost on the verge of breaking down.

Indeed she does break down, falling sick on March 21 and staying confined to bed until March 25. The uncomfortable truth, though, is that Fleming appears to be satisfied by overwork. She seems resigned to rather than relieved by the realization that she needs a rest. Her compressed account of her long illness in the last three entries of the Journal presages her illness and death from pneumonia eleven years later in 1911, at age fifty-four. The logic of the strike seems to haunt this part of her story, as if by choosing not to preserve her self when she felt "tempted to give up" and "on the verge of breaking down", Fleming lost the chance to choose entirely.

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32 Alice Kessler-Harris, *A Woman's Wage: Historical Meanings and Social Consequences* (University of Kentucky Press, 2014) 8-9.

"some friend at a distance"

I am (re-)reading Fleming's Journal in April, 2019, at home on the evening after a workday spent at the Astronomical Photographic Plate Collection at the Harvard College Observatory, where I am a Curatorial Assistant. It is known colloquially as the Plate Stacks, a reference to library stacks. Twelve of us are engaged in the digitization of the astronomical photographs, performing technical tasks in shifts: preservation imaging, cleaning, digitizing, filing, and mending the photographs (we always refer to them as "plates," perhaps because to our twenty-first century eyes they seem far removed from photographs). Our workplace is next-door to Williamina Fleming's, in a fireproof building constructed in 1931 as a crosswise attachment to the previous Astrophotographic Building, which is now used as offices. The plates were moved down the corridor from the old building to the new building by hand. There were between 300,000 and 400,000 plates in the collection in 1931; today there are over 500,000. Collecting ceased in the 1990s, when Eastman Kodak stopped manufacturing the photographic glass dry plates used to capture the photographs. Today photographing stars is associated with hobby astronomers or camera connoisseurs. An image by itself — without a software pipeline to make meaning out of it — doesn't count as science.

In April, 2019, the Curator is the only permanent employee of the Plate Stacks. National Science Foundation grants fund the equipment and the staff who digitize the plates. The staff includes one full-time Curatorial Assistant and up to thirteen Digitization Assistants (LHTs, or less-than-half-time employee — pronounced "lights"), in Human Resources's terms. Like Fleming's staff, we are a team of assistants. Our work, too, is a kind of care work, although it is not precisely care of the photographs. We facilitate the creation of digital surrogates and, ultimately, the programmatic extraction of useful data from these digital images. It is a dematerialization project. We are caretakers of data and incidentally caretakers of objects that, until they are digitized, are the unique sources of that data.

What do I gain by exploring Fleming's workplace, so closely related to my own? Looking backward is a practice with a history at the Observatory, sometimes with superstition attached. Institutional lore attests to the presence of ghosts in the Stacks, on the premise that some employees (women) died leaving their work unfinished. I haven't met the ghosts but I have bumped into leftover institutional structures. The present-day gender balance of the Plate Stacks, for example, nearly mirrors Fleming's workplace of 1900: a tenured male professor has charge of the Collection, and oversees a female Curator, who in turn oversees a staff of up to 13 assistants, mostly women. Most of us are white by twenty-first century standards, and everyone in a management role is.

In contrast to its prominence within the Observatory in 1900, the Astronomical Photographic Plate Collection in 2019 is a modest and relatively quiet part of an expanded parent institution, the Harvard and Smithsonian Center for Astrophysics, which occupies a new building complex on the old ground. A Gender Equity Committee was created in 2002, and five years later issued a grim but constructive report on institutional gender equity. The report shows, among other data, that in 2005 male astronomy faculty members outnumbered female faculty members 17 to 1, women made up 66 per cent of administrative and support staff, and women in all roles were more likely to be in a lower pay grade than men, who were evenly distributed across all pay grades (male and female were the only gender categories in the report). The Report on Gender Equity recommended taking action by

establishing an ongoing mechanism to monitor gender and racial equity, appointing women to leadership positions, and changing workplace culture. Seventeen years later, new programs are starting to change the demographics of the youngest people at the Center for Astrophysics. And the Equity and Inclusion Club, initiated in 2018, meets weekly to discuss and address the underrepresentation of people of color and women in science in general and at the Center for Astrophysics in particular.

Yet still, against this backdrop, the narrative of Harvard's women computers sometimes feels uncanny. Has the structure in which we assistants work changed since 1900, or hasn't it? In media coverage and outreach programs, the story of the women computers is many things to many people: evidence of the institution's and Edward Pickering's progressiveness, evidence of the institution's lack of progressiveness, an inspiring model for girls studying science, a reference point for measuring how far we've come, a human-interest draw for the development office, a source of regret, a source of pride. Articles about Williamina Fleming, Annie Cannon, and Henrietta Swan Leavitt have been published in every major magazine in the country under the banners of forgotten women and unsung heroes.[cite] Dava Sobel wrote a bestselling history, published in 2016, *The Glass Universe: How the Ladies of the Harvard Observatory took the Measure of the Stars*. The story is told over and over again, and for this reason we must give it more attention, recover the throwaway details, acknowledge its unintelligibility and its transnational political and economic contexts, and find and question its legacy in the institutions we have inherited.