III

The First Women Programmers, 1940-1965

The role of women programmers grew with the autonomy of computers and computing. Even before electronic computers came into existence, when they were being prefigured by a practice of hand computing, women were present, if in a marginal role. But as computers grew powerful, they imposed their own rules on their environment, and the status of the women who programmed them rose. However, this was still a limited increase in status. The most drastic social change would have to wait for correspondingly drastic technological change. It would not be until operating systems and compilers for high-level languages came into general use in the early 1960's, running on transistorized computers, that software systems of essentially unlimited complexity would become feasible. Until then, womens' role would be expansive but still circumscribed.

Women computer programmers are as old as the computers they have programmed. While significant doubt has been cast upon Ada Augusta Lovelace's status as a computer inventor,[1] this doubt also tends to connect itself to the reputation of her colleague, Charles Babbage. For Ada Lovelace's every victorian feminine

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1. see Dorothy Stein, Ada: A Life and a Legacy, The MIT Press, Cambridge, Mass, 1985

flutter, there is a matching doubt about Charles Babbage's honesty, and about the potential of the Analytical Engine to work as designed. All three deserved each other, in short.

However, when computers became factual artifacts, rather than speculative projections, the women who came with them also became substantial technologists. The first real computers, and the first real women computer programmers emerged during the second world war. This was the era of 'Rosie the Riveteer.' Women got to do an extraordinary range of jobs which they had not been allowed to do before, and which they would be expected to stop doing, once the war was over and the soldiers came home.

In this context, it was not surprising that women were recruited for the various computer projects. Indeed, even before there were electronic computers, women had been recruited as human computers, doing calculations for engineers with adding

machines, slide rules, etc.[1] For example, in the middle of 1942, the National Advisory Committee for Aeronautics had a seventy-five woman computing section at the Langley Laboratory supporting 450 engineers.[2] As Paul Ceruzzi points out, while women computers were paid more than secretaries and typists, their prospects for promotion were extremely limited. At Langley, the calculations themselves were largely subordinate to the operation of wind tunnels.[3] This subordination must have gone a long way towards limiting the promotional prospects of women computers. At a certain point, a more senior post would have involved moving out of calculation into a different cluster of technical skills.

However, with the advent of the fully developed automatic

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1. This was an older tradition in science. As Margaret W. Rossiter points out (Woman Scientists in America: Struggles and Strategies to 1940, Johns Hopkins University Press, Baltimore, 1982, p. 53-57), in the late nineteenth century, the rise of a comparatively mathematical variety of astronomy had been based on women computers. Women had been excluded from the other line of growth in astronomy, use of observatories in more and more remote locations, in search of a perfectly clear sky.

By contrast, the first notable American woman astronomer, Maria Mitchell, had been able to make her observations from a platform mounted on the roof of her parental house. This kind of structure is known in New England as a "widow's walk," being the place where the latter-day Penelope would customarily wait for her seafaring husband. Still, at night, it represented the outer fringe of freedom for a woman. As Mitchell tells it: "...a man who climbed up a fence and spoke to me, in the stillness of the small hours, fairly shook not only my equanimity, but the pencil which I held in my hand. He was quite innocent of any intention to do me harm, but he gave me a great fright." (diary entry for Dec. 5, 1854, reprinted in: Eve Merriam, ed., Growing Up Female in America: Ten Lives, Dell Publishing, New York, 1973, orig. pub. 1971, p. 90)

2. Cramer Memorandum, reproduced in: Paul E. Cerruzzi, When Computers Were Human, Annals of the History of Computing (1991) 13:237-244, Springer Verlag, New York, p. 242

3. ibid, p. 238-40

computer, extended calculations began to take on a life of their own. Instead of ending with each computing project, the calculations grew into an ongoing practice of computer programming. Much of the effort went into work which did not pertain to any particular computing project, but rather to the development of greater capacity to handle computing projects. Women could find a place in this work without reference to their ability to enter the 'customer' fields.

Grace Murray Hopper came to the Mark I project from Vassar, where she had gotten her bachelor's degree in 1928, and where she had returned to teach after attending graduate school and getting a doctorate in Mathematics at Yale in 1934.[1] This was an example of a typical career pattern for a woman scientist of her era.[2] To use a military analogy, when Hopper was sent to Harvard to work on the Mark I in 1944, she was a recalled reservist of graduate-school academia. She was immediately put to work calculating mathematical functions, but she was also given the task of writing a manual for the machine.[3] Unlike the calculations at Langley, the Mark I was complex enough that it could support an internal career ladder. Extensions of programming the machine were self-contained. They did not lead off into other fields, such as gunnery. Rather, writing a manual for an existing computing machine necessarily shaded off into the design of a new

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1. Eric A. Weiss, Biographies Column, Obituary of Grace Murray Hopper, Annals of the History of Computing, 1992, v. 14[2]:56-58

2. see Rossiter, op. cit. p. 18

3. Weiss, loc. cit.

and better computing machine. Thus, Grace Hopper was launched on an upward spiral eventually leading to COBOL.

A growing role for women was even more pronounced at the ENIAC project, starting in 1943, and the center of this role was Adele Goldstine, wife of Herman Heine Goldstine. Herman Goldstine was officially the "representative of the Ballistics Research Laboratory,[1]" that is, the army project officer, but he was, de-facto, the executive officer of the ENIAC project, the manager of details too insignificant for the likes of John Mauchly, Presper Eckert, and John Von Neumann to worry about. The wives of the male mathematicians who organized the first computers were often themselves mathematicians, probably a normal consequence of the pairing-off of graduate students. If their husbands became connected to a labor vacuum, and were perforce turned into recruiters, the wives were likely to be the first recruits. Apart from Adele Goldstine, two examples would be Mary Mauchley and Klara Von Neumann.

When appointed the previous year, Herman Goldstine had been dissatisfied with the efforts of several retired University of Pennsylvania professors who were supposed to be running a program to find suitably qualified women and train them as human computers. The retired professors were "quite elderly," and "no longer up to the strain of teaching day-long courses."[2] Perhaps, too, they did not choose to overcome their prejudices against

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1. Herman Heine Goldstine, The Computer from Pascal to Von Neumann, Princeton, N.J., Princeton University Press 1972, p. 155

2. ibid, p. 130, 133

women. Goldstine had no time for any of that. He needed human computers-- instantly. His response was to sack the professors and give the job to his wife, Adele; Mary Mauchly; and Mildred Kramer, the wife of a University of Pennsylvania Assysriologist.[1] The first rule of a coup-de-etat is to have it over and done with before protests can materialize. Goldstine was hardly going to go monkeying about with want-ads and employment bureaus when there was someone suitable close at hand. It was a successful appointment, as was duly proven by the energy with which Adele began methodically combing the eastern seaboard for prospective women computers.

When ENIAC was ready for programmers, six of the best women computers were diverted to be retrained as programmers: Kathleen McNulty, Frances Bilas, Elizabeth Jennings, Elizabeth Snyder, Ruth Lichterman, and Marilynn Wescoff.[2] Adele Goldstine, as one of the two people who understood how to program the machine, was their teacher. She had written the operation manual for ENIAC, and, with her husband, had set up the first problem for the official demonstration. [3] Likewise, the two of them had jointly instructed and otherwise worked with the physicists from Los Alamos on an undescribed project, in which the Goldstines were only cleared to know the mathematical equations, rather than the

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1. ibid., p. 133-35
2. ibid, p. 202
3. ibid, p. 229-230

underlying physics.[1]

Thus, by the end of the Second World War, women had gone from purely subordinate human computers to increasingly autonomous computer programmers. In so doing, they had occupied a variety of managerial roles and performed a variety of technical functions.

Unlike what happened in some other fields, the end of the war did not signal the end of women's role in computer programming. Ida Rhodes, a russian-born mathematician, had joined the Works Projects Administration's Mathematical Tables Project in 1940. The Mathematical Tables Project was a typical WPA operation, intended to relieve unemployed mathematicians, and at the same time do useful work in the public interest, in this case by compiling mathematical tables. By 1940, its relief function must have been in eclipse, as male mathematicians were drawn into the war effort. It was only then that Rhodes, then forty years old, and a mathematician of nearly twenty years standing, had been taken on. By 1946, the Mathematical Tables Project had been absorbed by the National Bureau of Standards. In 1947, Rhodes was transferred to NBS's program of computer development. In the lull between the Second World War and the cold war, digital computing was still a growing field, even if the most ambitious inventors, such as Jay Forester, had funding difficulties concerning their most radical and expensive proposals. Ida Rhodes soon found her own niche, developing an early computer language, and then the first program for Social Security. And then she put her Russian

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1. ibid, p. 214-15

origins to work, becoming a pioneer in Machine Translation, that is, the use of computers to translate human languages, eg. Russian to English.[1]

By 1960, out of a total of 13,000 programmers, 4000 were women.[2] They were not confined to being low ranking assistants either. Out of the twenty-eight persons who had participated in the COBOL short range committee in 1959, seven were women: Deborah Davidson and Jean E. Sammet of Sylvania; Mary K. Hawes of Burroughs; Frances E. Holberton and Nora Taylor of the United States Navy's David Taylor Model Basin; Sue Knapp of Honeywell; and Gertrude Tierney of International Business Machines.[3] Thus, women were hardly in a marginal position vis a vis programming.

Women had made their way into the very heart of computing. They had gone from being technicians playing limited roles in

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1. Eric. A. Weiss, "Biographies-- Obituary of Ida Rhodes," IEEE Annals of the History of Computing, 1992, v. 14[2], p. 58-59

2. Statistical Abstract of the United States, 94th Annual Edition, 1973, U. S. Department of Commerce, Table 375, "Experienced Civilian Labor Force...," pp. 235-239

3. Jean E. Sammet, "Brief Summary of the Early History of COBOL," Annals of the History of Computing, Vol 7[4], October 1985, pp. 288-303, p. 293

Herman Goldstine states (op. cit., p. 202) that John V. Holberton married Elizabeth Snyder, not Frances Bilas. However, such a fact would not appear in the collection of official memoranda from which he wrote his memoirs. Unless he was such a pack-rat as to preserve wedding invitations, he may have been working from fallible memory. However, if the Frances Holberton of 1959 and the Frances Bilas of 1944 were the same person, that would make her an alumni of ENIAC.

Parenthetically, a model basin was naval architecture's equivalent of a wind tunnel. Models of ship hulls were dragged back and forth though a tank the size of a swimming pool to determine fluid drag.

other peoples' work to being experts developing large general purpose systems having a status and prestige independent of the particular uses the systems were put to. This status applied to their developers. By transcending any one purpose, and consequently, any one user of their skills, programmers, women included, were transcending the status of servants or subordinates, and becoming independent.

However, the new software systems which women programmers were working on were still very young. Many of these systems were still being developed rather than being put into use as yet. In a social as well as a technological and economic sense, their full power was not yet available. The capability of liberation which they could supply women was still limited, decreasing in proportion to the distance from the computer. Getting paid was a comparatively simple matter. So was freedom from interference with work. A woman programmer who wrote software for a male engineer or accountant would do so with the prerogatives of a professional. "Bumblebrain," the archetype of quasi-competent middle management, and the despair of every low-status woman worker, was of course quite incapable of reading a program, and hence incapable of critiquing it, constructively or otherwise.

Employment, and even preferment, were sometimes accompanied by very little personal respect at this stage. Women programmers

found themselves doing undignified things like 'babysitting'[1] their male colleagues' wives at conventions. The gaining of respect would have to await further technological progress.

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1. There is no other word for it. For example, at the 1960 Western Joint Computer Convention, women apparently employed on the staffs of various firms were formed into a committee to entertain the wives. As the preliminary advertisement put it: "Delegates Attending the 1960 Western Joint Computer Conference may cheerfully neglect their wives for business-at-hand, knowing that a well-rounded program of social events has been organized expressly for the benefit of the ladies."
   The most ambitious part of the program was a popular-education- type lecture by a Miss. Phyllis Baxendale of IBM. The lecture was entitled: "Conversations with Computers," and concerned "...some oddities in the conference's technology." It was not apparently much of a success, as no mention was made to it in the follow-up reportage.
   What did succeed was a day trip to Sausalito, with fashion show and handicraft shop tour. A hundred and thirty women registered for the wives' program: a hundred and ten attended the fashion show. But of course over two thousand persons attended the computer conference-- which was presumably a stag affair. In assuming that the wives could not find something to do on their own account in a cosmopolitan city like San Francisco, the conference organizers were firmly relegating them to the status of children.
   Announcement DATAMATION, March/April, 1960, p.48; After the fact report, May/June, 1960, p.23